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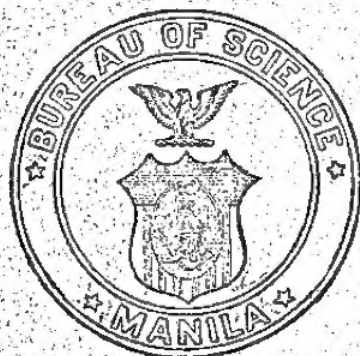
THE PHILIPPINE JOURNAL OF SCIENCE

ALVIN J. COX, M. A., Ph. D.
GENERAL EDITOR

SECTION D
GENERAL BIOLOGY, ETHNOLOGY
AND ANTHROPOLOGY

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REPORT OF THE INTERNATIONAL PLAGUE CONFERENCE.

Held at Mukden, April, 1911, under the auspices of
the Chinese Government.

Edited by ERICH MARTINI, G. F. PETRIE, ARTHUR STANLEY, AND RICHARD
P. STRONG.

483 pages, 15 plates (2 colored, 4 half-tones, 12 charts and maps).

Order No. 415.

Cloth, \$3.50; paper, \$2.50 United States currency, postpaid.

The proceedings of this International Conference and information gained therefrom, together with the results of certain bacteriological investigations, constitute the present report.

Nothing hitherto has been published which gives such a complete and comprehensive account of the entire subject of pneumonic plague.

Delegates from America (United States of), Austria-Hungary, France, Germany, Great Britain, Italy, Japan, Mexico, the Netherlands, Russia, and China attended the Conference.

The Bureau of Science of the Government of the Philippine Islands has been appointed sole agent for the distribution of the printed proceedings of the International Plague Conference.

THE SUGAR INDUSTRY IN THE ISLAND OF NEGROS.

By HERBERT S. WALKER.

145 pages, 10 plates, 1 map.

Order No. 412.

Paper, \$1.25 United States currency, postpaid.

Considered from the viewpoint of practical utility, Mr. Walker's Sugar Industry in the Island of Negros is one of the most important papers published by the Bureau of Science. This volume is a real contribution to the subject; it is not a mere compilation, for the author was in the field and understands the conditions of which he writes. The following is a brief synopsis of the contents:

Tables of soil analyses, both chemical and physical; analyses of the cane, juice and bagasse; estimates based on actual information as to the costs of production and of cultivation; and estimates of the cost and location of possible central factories. The island is considered by sugar-producing districts; the area of cultivation and the production per hectare are given, and the possibility for future expansion discussed.

The plates illustrate various phases of sugar industry from the cultivation of the field to the transportation of sugar in native sailboats.

A MANUAL OF PHILIPPINE SILK CULTURE.

By CHARLES S. BANKS.

53 pages, 20 plates.

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Paper, \$0.75 United States currency, postpaid.

The silk industry is particularly adapted to be undertaken by persons with small capital, and like the making of hats in the Philippine Islands it should thrive with a little encouragement.

In A Manual of Philippine Silk Culture we have presented the results of several years' actual work with silk-producing larvae together with a description of the new Philippine race. Half-tone plates illustrate in natural size silkworms in different stages of development, pupae, adult moths, samples of cloth made from eri silk, hand reel, and silk house. Other plates illustrate the various appliances used in raising silkworms and in spinning silk; hand and power reels are illustrated; working drawings are given for a silk house and for a hand reel.

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D. GENERAL BIOLOGY, ETHNOLOGY
AND ANTHROPOLOGY

VOL. VII

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THE HABITS OF FIDDLER-CRABS.

By A. S. PEARSE.¹

(From the Zoological Laboratory, University of the Philippines.)

The habits of fiddler-crabs are of particular interest to naturalists. Since the time of Darwin ('74), these crustaceans have been believed to furnish evidence of sexual selection on account of the bright coloration and enormous chela of the male; these characteristics contrasting strongly with the comparatively dull dress and the small bilaterally symmetrical chelipeds of the female. Alcock ('92, '00, '02) is convinced that ('00, p. 351)—

In one species, at any rate (*Gelasimus annulipes*), the males, which are greatly in excess of the females, use the big and beautifully colored cheliped not only for fighting with each other, but also for "calling" the females.

According to the same writer ('92), Milne-Edwards described a South American species in which the male and female lived together in a single burrow, the former closing the mouth of the burrow with his large chela. But Smith and Weldon are apparently not convinced that the purpose of the peculiar adaptations of male fiddlers has been demonstrated, for they say ('09)—

Though the genus *Gelasimus* is remarkable for the large size of one of its chelae the purpose of this peculiar adaptation is unknown in the various species.

They state that the chela is believed by various writers to be used for closing the burrow, as a weapon in combats, and as a means of attracting the female, but do not affirm that any of these uses have been demonstrated.

¹ Recently assistant professor of zoölogy, University of the Philippines.

During the summer of 1911, the writer worked among the tropical fiddler-crabs that swarmed in the estuaries near Manila and on the mud flats along Manila Bay. In some places these little animals covered the beach in countless numbers. At low tide their bright colors and active movements made them conspicuous objects that could not fail to attract attention. Five species and 1 subspecies occurred in this locality, 5 of them being abundant. In order of decreasing numbers those represented were: *Uca forcipata* (Adams & White?, de Haan),² *U. marionis* Desm. and *U. rathbunæ* Pearse,² *U. marionis nitida* (Dana), *U. annulipes* (Latr.), and *U. gimardi* (Milne-Edwards). The behavior of all of these species was similar. The observations described in the following pages were undertaken with the purpose of discovering: (1) the habits and relationships of the various fiddler-crabs inhabiting the estuaries of Manila Bay and (2) the use or uses of the peculiar adaptations of the males. They were made between May 1 and August 1 at the estuary extending from Pasay to Georgia Avenue in the City of Manila. This narrow, shallow *estero*, as such places are termed in the Philippines, is about 3 kilometers long and is bordered by native nipa-palm houses along a large part of its extent.

GENERAL HABITS.

The fiddlers of Manila Bay are diurnal. On bright days, moreover, many more individuals are seen outside their burrows than when it is cloudy, provided the mud be somewhat wet. In order to ascertain whether they were active at night, the writer went to a place at the edge of an *estero* where he had been making observations in day-light for about a week, and where the ground was thoroughly familiar to him. On this particular evening, June 16, the sky was overcast with clouds, but though rain threatened, the darkness was relieved somewhat by occasional flashes of lightning and by the dim glow from the electric lights of Manila. The writer stumbled to his station at 8.15 and sat quietly on the grass for fifteen minutes. Then he flashed the light from an acetylene bicycle-lamp suddenly over the most populous part of the *estero*. Not a fiddler was to be seen. The light was shaded while five hundred seconds were counted, and again flashed over the *estero*. No crabs were in sight, but a

²The writer's thanks are due Miss Mary J. Rathbun who examined these species. Acknowledgment is also due to Mr. Tom Jones, of the St. Louis University School of Medicine, who drew the figures appearing with this paper.

good-sized snake was just entering a burrow about 1 meter away. The lack of fiddlers on this occasion was probably not due to the inclement weather for these animals often fed serenely in great numbers during the day in the midst of violent rainstorms. Furthermore, as fiddlers are often active on moonlight nights, the conclusion seems to be warranted that a certain amount of light is necessary to bring them from their burrows. The observations of Holmes ('08) support this view since he found that *Uca pugnax* was strongly positively phototropic when tested under laboratory conditions.

At Manila the burrows of the genus *Uca* are found for the most part between low- and high-tide marks on the mud flats. Many of them are so high that they are covered only at the time of very high tides, and their openings therefore may not be inundated for a number of days at a time. It would seem, then, that the location selected for a burrow is apparently not a matter of chance. The different species show a preference for certain levels, and this results in more or less clearly-marked zones on the shore of an estero: (1) High along the edge of the shore *Uca forcipata* is found, (2) this zone grades into the one of *U. rathbunae* just below, while (3) *U. marionis* and *U. marionis nitida* are found in the softer mud of the deeper parts of the estero. The less abundant *U. annulipes* and *U. gimardi* were usually found in the second and third zones respectively. This stratification in habitats is very clearly shown (Table I) as the crabs emerge from their holes when the tide is falling.

TABLE I.—Giving the number of each species of fiddler-crab observed in a certain area as the tide was receding.

Date.	Time.	<i>U. forcipata</i> .	<i>U. rathbunae</i> .	<i>U. marionis</i> and <i>U. marionis nitida</i> .	<i>U. annulipes</i> .
June 15.....	p. m.				
	2.50	0	0	0	0
	3.00	2	0	0	0
	3.13	8	0	0	0
	3.35	22	8	0	0
	3.45	27	4	0	0
	4.05	31	10	0	0
	4.32	62	12	2	1
June 18.....	2.00	0	0	0	0
	3.15	2	0	0	0
	3.35	5	0	0	0
	3.51	11	1	0	0
	4.14	16	6	0	0
	5.12	70	14	1	1

It might be assumed that *U. forcipata* was the most abundant species in the locality chosen for these observations, but this was not the case. In order of decreasing abundance the species of this station were: *U. rathbunæ* (about 400 individuals), *U. forcipata* (275), *U. marionis nitida* (40), *U. marionis* (8), *U. annulipes* (3), *U. gimardi* (2).

In addition to their diurnal habits and discrimination in the selection of sites for their burrows, the fiddlers exhibited a third striking peculiarity in their reactions to tidal changes. Countless individuals were to be seen on the flats at low tide, and active feeding was carried on at such a time. The same was true when the sea was rising or falling. When the water threatened to cover the mouths of the burrows, however, a plug of mud was carried to the opening of each hole and drawn down after the owner in such a way as to shut him inside. During a period

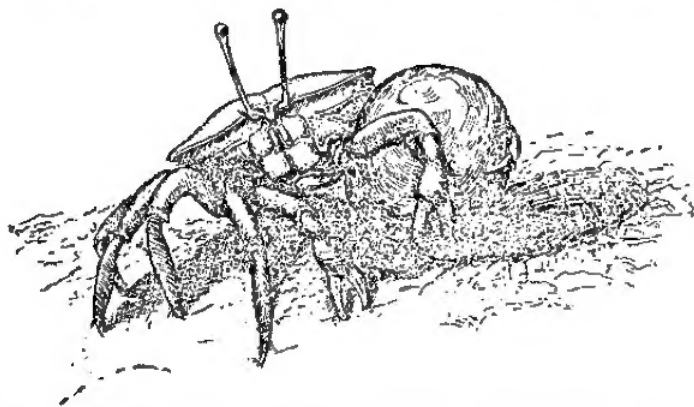


FIG. 1.—*Uca rathbunæ* carrying a load from her burrow. Drawn from a photograph.

of high tides, burrows in low situations often remained closed for several days; during low tides, those on higher ground might be left open day after day, though the flats dried out to such an extent that the crabs could not feed easily, and mostly remained at the bottoms of their burrows.

BURROWING HABITS.

In excavating her burrow, a female fiddler digs with the walking legs of either side. After a piece of mud has been pried loose by working under it with the legs it is carried to the mouth of the burrow and deposited outside. The males usually enter their burrows with the small cheliped ahead; and hence they usually carry loads of mud hugged close against the body by means of the first three legs on the side opposite the large chela.

During the summer, however, 3 males were seen to hold a ball of mud with the two walking legs just behind the large chela, and on one occasion a male carried 3 successive loads in this manner. The males do not use the large chela for burrowing. As has been stated, females dig and carry from the burrow with the first three legs of either side, there being no difference between the legs. In either sex an animal bearing a load walks on the two posterior legs of the loaded side and the four walking legs of the opposite side. The burden is always below the animal as it emerges from the burrow.

The successive loads of mud are often carried as much as two-thirds of a meter from the mouth of the burrow; usually, however, to a distance of 25 to 30 centimeters; sometimes they are not carried away at all and may even be built in around the mouth of the hole. At times, all the excavated material is carried to a certain spot at a distance from the mouth of the burrow; the writer has seen from 40 to 50 loads thus placed in a neat pile. Some individuals scatter mud over a space of 1 to 2 meters, two loads seldom being put in the same place. One individual had 2 dump piles and he varied his labor by carrying a few loads to one, and then a few to the other. The mud brought from the burrow is often spread out flat and searched over for food with the small chela. The rapidity with which dirt is removed from a burrow varies to a considerable degree; a certain individual may bring only one load in a forenoon, while others may work as fast as possible for an hour or more. Different fiddlers were seen to excavate as follows: 6 loads in twenty minutes, 16 in twenty-one, 6 in six, 26 in twenty-five, 5 in three, 11 in five and one-half; or, these individuals averaged one load every 3.3, 1.8, 1.0, 1.0, 0.6, and 0.5 minutes respectively.

As has been stated, the burrows are usually closed when the tide comes in. Often the mouth of a hole is prepared by bringing in a bit or two of dirt from outside or by carrying some mud from below; such masses are plastered around the mouth of the burrow and smoothed over to make the opening more nearly circular. When all is ready the crab goes a little way off and secures a disk of stiff mud which he carries back to the hole and draws down after himself in such a way that the mouth of the burrow is neatly and completely closed (fig. 2). The "plug" loosened from the floor of the estuary by pushing the walking legs beneath it, the crab "leaning back" to do so. The males always use the legs of the side opposite the big chela for this work, but the females employ those of either side. As it is carried to the burrow, the plug is held by the first three walking

legs; the chela (always the small one in the male) is pressed down upon it from above while the second and third legs support it from below. After it has been drawn into the mouth of the

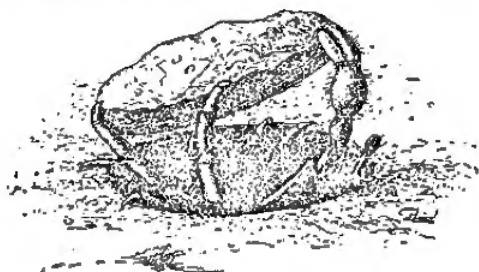


FIG. 2.—A fiddler-crab closing its burrow by pulling a disk of mud in after itself.

burrow, it is usually adjusted from below for a few moments, and then its surface often meets that of the ground in such a way that it is difficult to discern. It was observed that when the mud was somewhat dry, fiddlers frequently went to the edge of the advancing tide to secure softer material, and in this showed some discrimination.

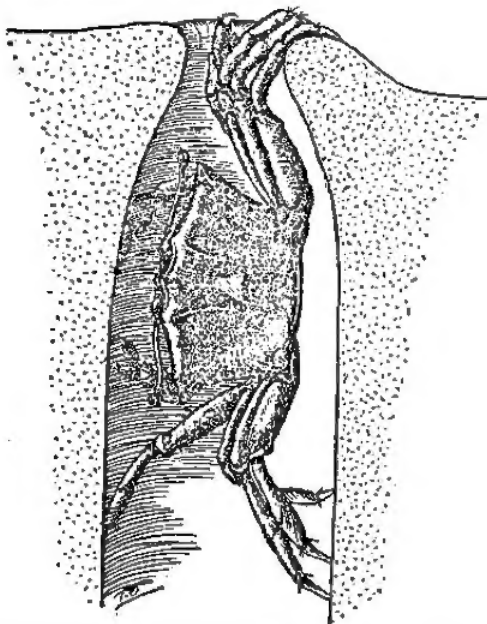


FIG. 3.—Showing an unusual method of closing a burrow.

Although the method just described was the usual one employed in closing burrows, fiddlers were twice seen to depart from it. Once a male pushed a mass of soft mud up ahead of him nearly

to the top of his hole so that he shut himself inside. On another occasion a nervous little female, after hastily carrying 3 loads of dirt from her burrow and plastering a couple of pieces of soft mud around her doorway, went part way into her burrow, and by scraping with the legs of one side (fig. 3) gradually decreased the size of the opening until there was barely room enough to draw her legs inside. She then shut herself in by pushing up soft mud from below.

When a fiddler wishes to open a burrow that has been sealed, it pulls the plug down inside. The plug must usually be left there for it was seldom brought out within a reasonable time in the numerous instances observed. Once a large *Uca forcipata* was seen to open his burrow by simply walking out of it, the plug being pushed to one side.

Fiddlers are very cleanly in their habits and often scrape themselves with the small chelæ or with the walking legs when, in burrowing or in some other way, they have accumulated dirt on any part of their body. They are particularly careful of the eyes and eyestalks and these organs are often folded into their sockets and rubbed a few times. Mud or débris is not allowed to accumulate about the mouths of the burrows. Fiddlers have often been seen moving such matter to some little distance where it was cast aside or pushed down the holes of other crabs.

Both sexes move sideways in entering the burrow, and the males more often have the large chela uppermost as they disappear. So far as the writer observed they always emerge in the same position as they enter; that is, the body is not turned around in the burrow. The holes are usually of uniform diameter, though they may be slightly enlarged at the bottom and occasionally turn off in a horizontal direction. They vary in depth from about 16 to 75 centimeters, and usually have water standing in the deeper parts, even when the tide is out.

PLACE ASSOCIATION.

A fiddler usually does not wander more than a meter and a half from his home and is ever ready to dart into it at the slightest provocation. Nevertheless, the writer observed a few instances in which particular individuals wandered 4.2, 4.5, 9, 9, and 12 meters from their respective burrows and returned. One peculiarly marked *Uca marionis nitida*, for no apparent reason, dug a new hole 4.5 meters from where he had first been observed; and a certain *U. rathbunæ*, whose burrow had been inadvertently closed by the writer as he walked over it, dug a new hole 2.4 meters away; but such cases were unusual, and

most crabs manifested a choice for a particular locality. On one occasion the writer was sitting motionless at the edge of the *estero* when a female fiddler came out of a burrow beside him. He quickly clapped a foot over the hole so that the owner could not enter. She sat perfectly motionless for fifteen minutes. Then, as the writer slowly moved away his foot, she made a dash to the spot where the burrow had been and tried persistently to enter, but was not able to do so on account of the mud that had been pressed down in such a way as to close the hole. She remained thus until the writer frightened her away by bringing his hand near her.

A number of peculiarly marked fiddlers were snared with a noose of thread as they emerged from their burrows and then carried various distances to see if they would return. Although the results of these tests, as shown in Table II, were quite variable, they indicate that fiddlers have some power of association in connection with the situation they may have chosen for a burrow. Although only 3 out of 11 crabs returned to the same spot, the writer was convinced that the behavior of these 3 showed an association for a particular place.

TABLE II.—*Showing results of moving fiddler-crabs various distances from their holes.*

Number of individual.	Distance moved in meters.	Returned—	
		To same hole.	To same locality.
1.....	9.0	No.....	No.
2.....	6.0	No.....	No.
3.....	4.5	No.....	No.
4.....	1.8	Yes.....	Yes.
5.....	6.0	Killed ..	Killed.
6.....	6.0	No.....	Yes.
7.....	5.4	No.....	No.
8.....	2.4	Yes.....	Yes.
9.....	6.0	No.....	No.
10.....	4.5	No.....	No.
11.....	2.4	No.....	No.

Numbers 1, 2, 3, 7, 10, and 11 were moved to new situations where high ground prevented them from seeing their burrows; 1, 2, 3, 5, and 11 were never seen after the day they were moved; 3, 6, 7, 9, and 10 at once occupied burrows in the new location, some of these dug new burrows and some may have occupied those already dug. Although number 1 was in plain view of the burrow where he had been captured, the writer could not

see that he made any effort to return during the twenty-nine days he was watched. Number 8 dug a new burrow where he was placed and occupied it for two days; on the third day he had returned to his old haunts, but was not occupying his original burrow and had dug a new one 45 centimeters above it; on the fourth day he was often seen to enter his original hole, although he continued to excavate the one he had started the day before; from the fifth day he occupied the burrow he had started on the third and his original burrow was allowed to become filled with mud. Number 4 wandered about for some little time, frequently going to the tops of the little mounds of earth as if looking about. He did not move directly toward his burrow; in fact, he sometimes went in the opposite direction, but after about an hour he had returned to it. Number 7, an *Uca annulipes*, dug a burrow where he was placed and occupied it for twenty-two days; during this time his original burrow had become completely filled; on the twenty-third day he had returned to his original station and dug a new hole within 30 centimeters of his original home.

It was by no means easy for a strange fiddler to make his way among his fellows through a densely populated portion of the estero. Dangers beset him on every hand. Number 5, a good-sized *Uca rathbunæ*, was captured at 1.56 in the afternoon, and thrown 6 meters from his hole down a small bay. He was an unusually timid individual, dodging into one hole after another and investigating his surroundings from time to time from the tops of hillocks; at 2.59 when he had progressed 2 meters toward his own hole, he unfortunately entered the burrow of a male *Uca marionis nitida* and emerged in a few moments shorn of most of his legs; only the small chela remained on the left side and the second and fourth walking legs on the right side. He hobbled into a shallow burrow a little way up the bank. Next day his cleanly picked "bones" lay bleaching on the flat.

Of the 11 crabs moved to new situations, 5 were not seen again, 1 was known to be killed (others may have been), 3 dug burrows in new localities, and 3 returned to their original homes. Of the 3 that dug new burrows, 1 was behind a high grass-covered ridge, but in the other 2 instances the fiddler's view of his old habitat was unobstructed. Three crabs showed a strong homing propensity and the fact that this did not appear in 3 other cases may have been due to an inhibiting factor or factors, such as the danger of travel or the lack of acute vision in certain individuals. It is also possible that there may be individual differences in the ability or inclination to form place associations.

FEEDING AND FOOD.

Female fiddler-crabs feed by scooping up mud with the hairy, spoon-like fingers of the chelipeds and carrying it to the mouth; the two hands alternate rapidly in this action. The males, however, use only the small cheliped when feeding. These appendages are well suited for the work they have to do, for their fingers are flattened and hollowed in such a way that admirable dredges are formed for carrying mud to the mouth. Feeding is not attempted when the flats are dry, and it is most active just after the tide has gone out, or along the edge of an advancing tide. The mouth-parts sort over the mud that is brought to them and a mass of rejected material collects below them. This material slowly drips as the animal moves about feeding, and is frequently wiped away with a cheliped.

On July 4, 20 stomachs of *Uca rathbunæ* were collected between 8.55 and 9.20 in the morning. These were placed at once in 10 per cent formalin, and two days later the contents of 6 were examined microscopically with considerable care. The objects discovered were as follows, in the order of decreasing quantity: Plant tissue, a branched alga, vascular plant tissue, small green algæ, small brown spores or cysts (?), fine silt, diatoms, protozoa, and a piece of leaf epidermis. Striated muscle fibers were also found in 2 stomachs, but these may have been loosened from the stomach wall of the crab itself. Whether this was true or not, the examination showed that the food of fiddlers consists mostly of vegetable matter. The stomachs of 2 individuals were completely filled with a species of alga and a little fine silt. Probably a portion of the unidentifiable plant tissue consisted of the same alga, which appears to be an important element in the fiddlers' fare. Although these animals seem to take mud from almost any locality, they are not indiscriminate feeders, the chelipeds and mouth parts apparently exercising considerable care in the selection of food.

BEHAVIOR.

A fiddler-crab lives on the mud flats crowded among vast numbers of his fellows, but his intercourse with them shows no development of "social" instincts. He has selected his most suitable habitat, and the fact that he is surrounded by hundreds or thousands of his own kind is more or less incidental. Each fiddler searches the mud around his hole for food and his "hand is against every man." He is ever ready to dart into his burrow, and if danger threatens he quickly retreats into this refuge. If

one of his fellows approaches too close to his domain, he rushes forth and enters into fierce combat. Each crab makes his hole the center from which all his activities are conducted, and he treats the approach of any intruder as an unfriendly act.

Though combats between 2 males are most frequent, males sometimes fight with females, and members of the weaker sex not infrequently struggle against each other. If 2 males that differ markedly in size fight, the larger combatant usually takes little interest in the contest and soon makes off, even though he may be hotly pursued by his smaller antagonist. When a small fiddler trespasses on a larger crab's territory, however, he is soon chased away. Males of different species frequently

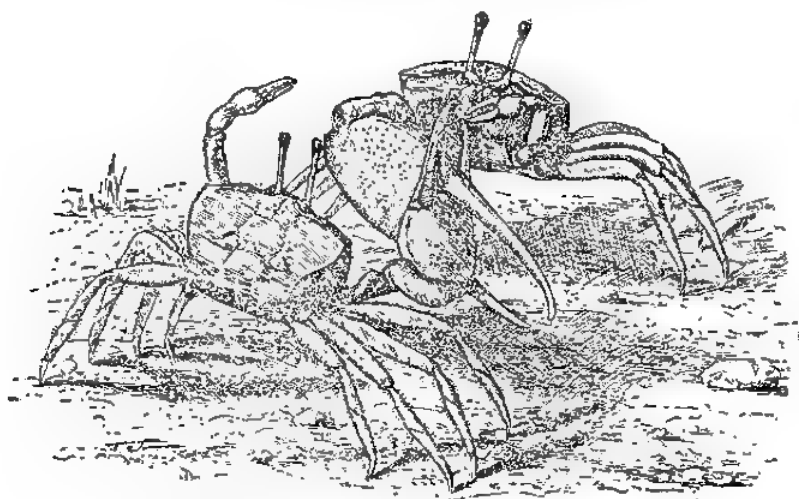


FIG. 4. Position assumed by male fiddlers when fighting.

“cross swords,” but the most sustained and spirited contests are between those of the same size and kind.

In fighting (fig. 4), the males face each other and often dance about excitedly, at the same time frantically waving the small chelæ. The large chelæ are then locked together, like two men shaking hands, and each contestant attempts to break off his opponent's claw by a sudden wrench. Such quick movements are often so violent that one of the fighters, rather than lose his claw, is obliged to loosen his hold and in so doing is thrown backward for a distance of from 60 to 90 centimeters. Although fights were frequent during the time the writer made observations, he saw only one crab dismembered (p. 121), and this individual did not survive the combat. In fighting, the large

chela was not seen to be used as a club as Alcock ('92, p. 416) maintains, but often served as a shield to ward off a thrust. If a male got the worst of an encounter, he often retreated into

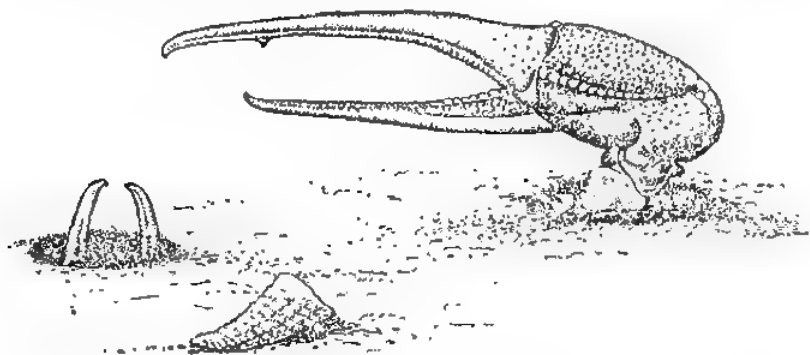


FIG. 5.—Fiddlers defending their burrows.

his burrow and guarded it by extending his large chela from the opening (fig. 5). Sometimes one male caught another napping and entered his burrow. In such cases the owner waited nervously about until the intruder came out and then chased him away, or he boldly went down after the stranger with his large chela extended before him and usually emerged soon after followed by the intruder. Males were not infrequently seen standing at "attention" on some elevation (fig. 6), for as much

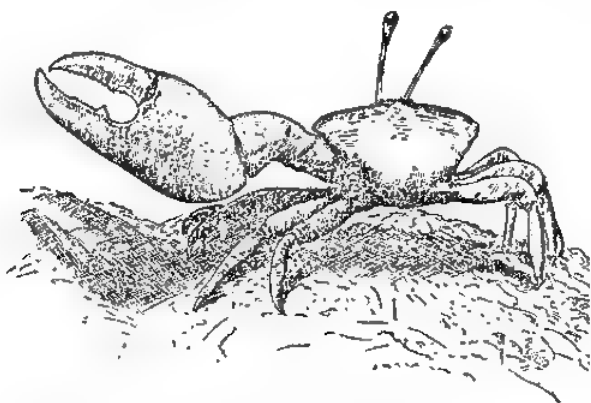


FIG. 6.—*Uca forcipata* standing at "attention." Drawn from a photograph.

as ten or fifteen minutes without moving. The writer was not able to determine the purpose of such actions. Perhaps these individuals were awaiting a mate, or an opportunity to fight.

There was a marked difference between the different species in regard to their relative pugnacity. *Uca annulipes* was the most active and excitable; *U. forcipata* was the most sluggish, though an excellent fighter when aroused. The fights between males and females were usually of short duration, and as a general thing were occasioned by one coming too near the burrow of the other. When the intruder was chased away the affair ended. In the combats between females, the contestants sometimes faced each other, but they usually stretched to their full height and danced about excitedly back to back and struck out behind with their walking legs.

Some of the activities of the fiddlers were like those displayed by higher animals while at play. The crabs frequently darted about apparently without a serious purpose, and were sometimes downright mischievous. On one occasion a male was half-heartedly pursuing a female. She went to her burrow, secured a plug near by, and shut herself in. The male then came directly to the burrow, seized the plug, and cast it to one side. The female was just emerging from the burrow when the writer ended the episode by frightening the participants by a sudden movement. Another time, two males (an *Uca marionis nitida* and an *U. forcipata*) of medium size were seen running about for perhaps half an hour over an area about 12 meters in diameter. They kept close together and acted like two mischievous sailors ashore. The tide was coming in rapidly, and in their rambles the pair came to a place where a large slow-moving *U. forcipata* was carrying a plug to close his burrow. They waited until the plug had been pulled down over the owner, then the *U. forcipata* went to the hole and removed it; and, as the outraged owner emerged, the plug-remover and his mate scuttled off toward the former's burrow some 4.5 meters away. He soon closed his own burrow, for the advancing water threatened to inundate it, and his companion hurried away down the estero. The writer watched him until he had gone more than 11 meters and was lost to view at the edge of the advancing water. To all appearances activities such as these just described were carried out in a spirit of sport.

Alcock ('00) believed that the males were "greatly in excess of the females," but this difference may have been assumed from only a casual observation. Some instances were noted by the writer in which the females outnumbered the males. For example, the counts shown in Table III represent the total

number of fiddler-crabs to be seen along the edge of a small bay on the afternoon of May 20, as the tide was going out. Furthermore, even if the females to be seen were actually fewer than the males, it could not be taken as proof that they were less abundant; for, as they use both chelæ, they are able to feed twice

TABLE III.—*Showing sexes of fiddler-crabs in view as the tide was going out.*

Time.	Females.	Males.
p. m.		
4.30	6	1
4.36	12	4
4.44	13	3
4.51	14	7
4.58	14	7
5.05	13	■

as fast as the males; therefore, they could obtain the necessary food in a shorter time and would be able to pass longer periods sealed in their burrows. The crabs along the estuaries of Manila Bay, in the opinion of the writer, are about equally divided between the sexes. However, the males are more active and conspicuous and might easily impress an uncritical observer as exceeding the females in number.

The behavior of the sexes toward each other is of particular interest. It was with deep regret that the writer was obliged to forego the pleasure of watching the fiddlers during the breeding season. Mating probably occurs at Manila "in the colder months," as Alcock ('92) has observed in India. No females were observed during the hot season (May 1 to August 1) that were carrying eggs or young, nor were any very immature fiddlers seen. The males frequently fought each other and stood at "attention" with outstretched chela on the top of some eminence (fig. 6), apparently awaiting a combat, but only a few cases of courting were observed.

The behavior of the sexes during courtship is important on account of its bearing on sexual selection. In one instance observed by the writer, the male waved his large chela and danced actively about the female with his back toward her for about five minutes. The female meanwhile hung around the mouth of her burrow, always keeping her face away from her suitor, while he made frequent attempts to climb over her backward. Although the male was unsuccessful in his efforts, he never turned his face toward the object of his attention. A

movement by the writer frightened these lovers and they both ran into the female's hole. This was the only time that a male and a female were seen to enter the same burrow. On another occasion a female pursued by a male entered her burrow. Her suitor went halfway in after her, paused a moment as if feeling something within the hole, and then went away. The female came out of the hole and resumed her feeding. Another male was seen pursuing a female twice his size. In both the latter instances the male faced toward the female and approached her "head on" or sideways without any dancing; the females kept their backs toward the males. Still another case was observed in which a male danced actively about a female keeping his back constantly toward her; she was as unconcerned as possible and continued to feed through the whole performance.

The writer was interested to note that all males that were dancing about females kept their backs continually toward them. In such a position the bright coloration on the male's large chela was almost if not wholly invisible to the female. Furthermore, although many females are dull colored, the brightest tints are found on this sex; and though the chelæ of many males are brightly colored, the greatest range of striking reds, purples, blues, greens, and whites (as seen by the human eye) are found on the backs and legs of the females. All these facts throw doubt on the conclusions of Alcock ('92) who says (p. 416):

I have been able to observe that, whatever other functions the great chela may serve—whether as a stopper to the mouth of the burrow, or as a nuptial support, as some have supposed it also, in the species under consideration, is (1) a club used in the contests of rival males, and (2) a signal to charm and allure the females. This last function is particularly apparent. As one walks across the mud one first becomes aware of the presence of these crabs by noticing that the surface of the mud is everywhere alive with twinkling objects of a pearly pink colour. Carefully watched, these prove to be the enormous chelæ of a crowd of males of *Gelasimus*, waving in the air, each little crab standing at the mouth of its burrow and ceaselessly brandishing its big claw. On closer observation, among every ten or so males a small clawless female may be seen feeding in apparent unconcern. If the female should approach the burrow of a male, the latter displays the greatest excitement, raising itself on its hindmost legs, dancing and stamping and frantically waving its beautifully coloured claw. From prolonged watching I feel convinced that the waving of the claw by the male is a signal of entreaty to the female, and I think no one can doubt that the claw of the male has become conspicuous and beautiful in order to attract the female.

Alcock's observation could not have been very detailed for he "did not actually see the rival males seize each other in the conflict," and he could scarcely have failed to do this if any

considerable amount of time had been spent. It would be easy for anyone observing the crabs in a casual way to believe that the males were trying to attract the females by their bright colors, but the writer saw nothing in the behavior of either sex that could be interpreted in that way. The males often wave their claws frantically, as Alcock says, but they apparently do this to an equal extent whether females are present or absent, and without any apparent reference to mating but often before fighting with another male.

Fiddlers treat other animals with suspicion. Any large moving object causes them to retreat at once to their burrows, although they soon emerge again if the object is not near at hand. Most crabs retreat into their holes when a man approaches within 15 meters, but if one is careful not to make any quick movements he can sit apparently unnoticed within a couple of yards of an active fiddler for hours at a time. Large adult crabs like *Sesarma bidens* are avoided, but small crustaceans of any species are at once attacked. Any strange animal, however small, is avoided; the writer once saw a small hermit-crab cause every fiddler near to run for its hole by moving quickly along the edge of the rising tide. The fiddler's burrow furnishes a retreat from many enemies, and his speedy reaction toward it in response to all movements in his field of vision would help protect him from the herons, snakes, skinks, frogs, toads, and fishes that commonly hunt along the shores of the estuaries.

In reacting to its surroundings, a fiddler-crab apparently uses its senses of sight and touch most, although the recognition of chemical substances may be important in securing and selecting food. The eyes are very quick to note any movement in the landscape; they are always held straight upward except when their stalks are being cleaned or when a crab is entering a burrow. Feeding probably depends mostly upon the tactile and chemical senses, for the usual position of the eyes is such that the small chelæ can not be seen as they pass food to the mouth. Such loud noises as whistling, hand clapping, gun shots, and locomotive whistles produced no apparent reaction from the fiddlers, nor did the stridulation of the large decapod, *Thalassina anomala* (Herbst), that builds its burrows among them.

GENERAL CONSIDERATIONS.

Although fiddler-crabs live together in enormous colonies, they show no coöperation with one another, nor do they manifest any tendency toward such communal existence as that displayed by

some other arthropods; for example, ants, bees, wasps, and termites. In this they agree with other crustaceans, for although this class of animals exhibits an endless variety of structural adaptations suited to various habitats and modes of life, none of them has apparently taken advantage of the opportunities offered by a coöperative communal association among members of the same species (except in some instances in which the male is intimately associated with the female). Although the females of many species carry their eggs and newly hatched young for a time, the association of the young with their mother is nominal, for she never feeds nor cares for them. The struggle for existence is nowhere more apparent than in the midst of a fiddler-crab colony. Each individual jealously guards the area about his own burrow and immediately attacks any invader of this territory. His pugnacity is ever ready to show itself against his fellows that swarm about him and against numerous competitors of other kinds that also seek to eke out an existence from the area he has chosen for his own.

At Manila, the fiddler's chief competitors for the food on the mud flats are: (1) two species of *Macrophthalmus* whose feeding habits and food are very similar to those of the fiddler, but that usually live farther from the shore in the deeper parts of the estuaries and hence overlap the fiddler zone on the lower side only; (2) two burrowing crustaceans, *Sesarma bidens* De Haan and *Thalassina anomala* (Herbst), sometimes exceeding the fiddlers in size, that live mostly along the upper side of their zone; and (3) some smaller animals, such as the numerous mud snails, nereid worms, and the less frequent hermit-crabs. In addition to honest competition the fiddler must reckon with some larger animals that seek not his food but him. Among these the snakes, skinks, frogs, toads, and fishes are important.

The behavior of the fiddler is admirably suited to enable him to gain a livelihood and at the same time escape injury or death from his enemies. His aggressive attitude toward members of his own genus and toward other crabs of similar size keeps enough space clear about his burrow to enable him to sift his simple diet from the mud in comparative safety. Furthermore, the way is thus left clear for retreat to his burrow if danger threatens, and the fiddler is not slow in dodging into his hole as soon as any strange or threatening object moves within his field of vision. His burrow is the center of all his activities, and his association for the place where it is situated is very strong. Fiddlers are protected from night prowlers by their

diurnal habits, and they escape the fishes and snakes that hunt at the edge of the advancing tide by closing the openings of their burrows when the water threatens to inundate them.

Although the majority of the reactions of fiddler-crabs are stereotyped and appear to be instinctive, yet they are open to some modification. The daily life of a fiddler is more or less of a routine—to dig a burrow, to seek food as long as the territory about his burrow is clear, to attack small aggressors, to retreat from large enemies, to plug the burrow when the tide comes in, to open it when the water recedes, to retire during darkness, and to mate at the proper season. These are his ordinary activities and they depend largely upon unvaried reactions. Some instincts are so strong that, although usually advantageous, they may be harmful; for example, place association and instinct to retire into her hole was strong enough to cause a crab to remain for some time in danger when the burrow could not be entered and she might have escaped by running away (p. 120). Nevertheless, a fiddler shows some ability to modify his reactions to suit circumstances; such as departing from his usual method of carrying mud from his burrow (p. 117), using different ways to plug the burrow (p. 118), and in some other activities.

A fiddler-crab is able to establish a place association for a certain locality, and to retain it for as long as three weeks (p. 121). Some activities (p. 125) might be interpreted as manifestations of a desire to play. The instinct to fight males of his own species and size is very strong in a fiddler, yet this instinct is more than a "fighting reflex," for he is slow to resent an attack by a smaller male (p. 123).

Concerning the structural differences between the sexes, it may be affirmed that the great chela of the male was not developed for burrowing or feeding, because he never uses it for either purpose; in fact, it is rather a disadvantage in either of these activities. The great chela closes the burrow inasmuch as it fills the opening as a weapon of offense (fig. 5), but is not used as a lid or stopper. It may be of some advantage in copulation, but this can not be affirmed until someone has actually seen the phenomenon. The great chela is of unquestionable use to the male in his combats with his fellows and in defending himself from other enemies. In this respect it is comparable to the secondary sexual characters of some other male animals, such as the stag's antlers, the cock's spurs, and

the walrus's tusks. Among higher animals in which the males possess such special aggressive organs, however, the females are protected and cared for to some extent, but nothing of this sort is known among decapod crustaceans with secondary sexual adaptations (*Uca*, *Alpheus*, and others). Thus, although many of the crustacea have two adaptations which might fit them for colonial life—through the mother carrying her eggs and young for a time, thus having opportunity to start a colony with them; and through the aggressive adaptations of the males, which might enable stronger individuals of that sex to gather a number of females about them—their instincts have prevented them from developing it.

The writer can not believe with Alcock ('92) who thinks "no one can doubt that the claw of a male has become conspicuous and beautiful in order to attract the female" and that "it is used as a signal to charm and allure the females." In support of Alcock's views we have: (1) his own opinion, which, though apparently the result of more or less casual observations (p.127), is not to be taken lightly; (2) the conclusion of the writer from his observations at Manila that the colors of male fiddlers are perhaps most uniform on the great chela and more variable on other exposed parts of the body. Against Alcock's views may be urged: (1) that during the most ardent courtships observed by the writer (p. 127), the males kept their backs constantly toward the females so that the great chela could not be seen; (2) the chela is not always "bright" colored, at least as seen by the human eye, and the males that danced were not always bright; (3) other crustacea depend little if at all upon the sense of sight in choosing mates (Bethe, '97; Holmes '08; Pearse, '09; Chidester, '11), and there is some doubt as to the ability of crustaceans to discriminate colors (Pearse, '11); (4) at Manila the female fiddlers often were, to the human eye, more brightly colored than males of their own species, and the female's bright colors were on her back and legs so that they could readily be seen by a male dancing behind her but *she* did no dancing. The writer is convinced that the male dances about the female in order to induce her to mate with him, but, from his own observations, doubts whether the male's coloration is effective in influencing her to do so. The matter ought to be reexamined during the active mating season with special reference to color. By observing the coloration of the males actually chosen, by painting the chelæ of rejected suitors, or by other tests, a

definite conclusion could doubtless be reached. Until such experiments have been made it can not be affirmed that fiddler-crabs show the operation of sexual selection through color-discrimination.

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ILLUSTRATIONS.

TEXT FIGURES.

(From drawings by Tom Jones.)

- FIG. 1. *Uca rathbunae* carrying a load from her burrow. Drawn from a photograph.
2. A fiddler-crab closing its burrow by pulling a disk of mud in after itself.
3. Showing an unusual method of closing a burrow.
4. Position assumed by male fiddlers when fighting.
5. Fiddlers defending their burrows.
6. *Uca forcipata* standing at "attention." Drawn from a photograph.

THE MANGYANS OF MINDORO.

By MERTON L. MILLER.

(*From the Division of Ethnology, Bureau of Science, Manila, P. I.*)

The Island of Mindoro lies directly south of Manila, distant only twelve hours by the usual steamship routes. Notwithstanding the facts that it is near Manila, that it has a varied topography, much cultivable land and valuable forests, it is one of the least known, least developed, and has one of the least dense populations of all the Philippine Islands. For some reason which Americans have never been able entirely to fathom, Mindoro had the reputation in Spanish times of being an unhealthful place. This to some extent may account for the tardy development and scant population which the island presents to-day.

The Christian people of Mindoro number about 45,000. They occupy a narrow coastal strip, extending with frequent interruptions around the entire island. By far the larger proportion of them are on the north and east coasts. They are almost entirely Tagalogs and Bisayas, the former in the northern part of the island and the latter in the southern. It is only along a few of the streams that the Christian people have made settlements in the interior, and these settlements are but a few miles inland. It does not appear to have been fear that has led the Christian Filipino to cling to the seashore, but simply the natural tendency of man to remain near the ocean until some necessity arises to urge him inland or some advantage appears to be derived from such a movement. Apparently, there has been nothing to urge or induce the coast people of Mindoro to move into the interior.

The interior is to a great extent unoccupied, but scattered all over this part of the island are a primitive people who generally are known by the name Mangyan and who probably number from 5,000 to 20,000 souls. Owing to the lack of trails and the

consequent difficulty of gaining access to these people, it is practically impossible at the present time to form an accurate idea of their number.

So far as I can judge from my own acquaintance with the Mangyans¹ they are an entirely friendly, harmless people, peaceable to the point of timidity. Weapons are not common among them, and in some sections they seem to have only working tools and appear to be without offensive weapons of any kind. I should add that there is one section of them of whom I have seen little. They live west of Bongabong on the east coast; a part of them are known as Bangons and a part as Bukils. It is these people who are said to have tails, according to a story told by the coast Filipinos. If the few Bukils whom I have seen were typical, their costume, customs, and general appearance indicate that they are closely allied to the Mangyans elsewhere in Mindoro. My interpreter, who talked without difficulty with the Mangyans near Bulalakao on the east coast, found it no easy matter to understand the Bukils in the interior. The fact that he could understand them at all, even though with difficulty, shows that the dialects in use by the two peoples are closely related.

The best way to give a picture of these widely-scattered people will be to describe the inhabitants of some one limited section, at the same time indicating the details in which those of other parts of the island differ from the people of the section described.

Various settlements of Mangyans, containing from 8 to 30 people, are found near Bulalakao, at distances varying from three to six hours' travel on foot. Some of these are on steep hillsides in a limestone region where the soil is thin. Even the crops are planted on hillsides so steep that the use of animals would be impracticable, even if the people had work animals. In these locations advantage is taken of any small level spot for erecting two or three small houses. The people live in them for years, apparently until the houses are about ready to fall. Because of the topographic conditions, it might not be easy in all cases to find a suitable site for a large number of people to live together.

Other settlements are located on rolling land not far from the ocean, where the soil appears to be rich and deep. In these places there is nothing to interfere with the building up of comparatively large settlements, excepting the disinclination of

¹I have visited them in five widely separated localities.

the people. A brief, detailed statement, describing the location of several of the settlements, will throw some light on the life of the Mangyans.

Dangas,² about five hours' walk from Bulalakao, is reached by traveling over a hilly country gradually rising until the last half-hour of the journey, when the trail becomes so steep in places as to be almost a cliff. A gently sloping ground, where there are 5 houses, is found above this cliff. About 20 people live here. One hour beyond Dangas is another small settlement of 5 houses and about 30 people. The trail from Dangas leads up the ridge of a long, steep hill, across a narrow valley, and part way up the opposite slope. The houses are on a small, flat spot on the hillside. Budburan, a settlement of 3 houses, is located in a rolling country about 3 kilometers from the ocean and five hours' travel on foot from Bulalakao. Here there is a large area, alternating between grass-covered and wooded country, where thousands of people might live.

In the interior of Mindoro I saw no groups of houses nor even two houses in sight of each other. The majority of the few houses which I saw were located at points on steep hillsides where the slope was a little more gentle and offered space for a small house. The cultivated fields were close by. I saw a few little hovels, built near small streams, just high enough above the stream to be safe in time of high water. These hovels appeared to be temporary, the more permanent homes being on the hillsides far above the streams.

Near Abra de Ilog many of the Mangyans live in isolated houses built high on steep hillsides like those in the interior of the island. Here, too, as well as along the Bakó River and on the shores of Lake Nauhan, there are small groups of houses hidden away in the forest near the clearings and usually near a small stream.

HOUSES.

The houses in which the Mangyans near Bulalakao live are like those built by their Christian neighbors. When they are new they are neat and attractive, but they are allowed to deteriorate, although people continue to live in them as long as they are at all habitable. They are built from 1 to 2 meters above the ground. The roof and the sides are usually of nipa or buri

²Lisboa Vocabulario de la lengua Bicol, gives: *An̄gas*=*An̄gpás*, steep cliff; *Parañgasan*, open place which the (prevailing?) wind strikes from the front.

palm.³ The leaves, of which the sides are made, are held down by horizontal strips of bamboo about 30 centimeters apart. The floor is of split bamboo, sometimes made neatly of strips of uniform width, but more often of pieces of bamboo split open and laid out flat. The doors and windows are sometimes arranged to slide along a bamboo pole and sometimes to swing upward and outward. The houses are of good height, so that it is possible to stand erect almost anywhere inside, although it is necessary to stoop a little in order to pass through the door. Access to the house is gained by means of a short bamboo ladder made as wide as the door.

Just outside the door there is often, but not always, an open-air platform on a level with the floor of the house. This is used in fair weather by the owners when pounding out *palai*⁴ or when engaged in other household duties; it also serves as a lounging place.

Within the house there is usually a bench at one side about 50 centimeters above the floor and 40 centimeters wide. This is made of 1 or 2 hewn boards and is fastened to two of the main posts of the house by rattan. The fireplace is made by fastening together 4 pieces of wood or bamboo into a quadrilateral and filling the space thus inclosed on the floor with earth to a depth of from 8 to 10 centimeters. Three stones serve as a rest for each vessel to be put over the fire. In one corner of the house there is either a large earthenware jar or a number of pieces of bamboo for holding water.

Suspended from the roof timbers are a few baskets which may contain *camotes*,⁵ bananas, maize, or some pieces of clothing. A few wooden spoons may be seen placed behind the roof beams. Sleeping mats are rarely seen. On the whole, the house furnishings are scanty.


The Mangyans sometimes build small, rude shelters near their cultivated fields in which they live while sowing, caring for, and harvesting the crops. They do this partly because it is more convenient to live near-by while they are putting in the crops and partly to protect the latter from birds and other animals while they are maturing. After harvesting the crop, they return to the place where they ordinarily make their homes.

The Mangyans in the neighborhood of Bulalakao build the

³ Nipa palm, *Nipa fruticans* Wurm.; buri palm, *Corypha elata* Roxb.

⁴ Unhusked rice.

⁵ *Ipomoea batatas* Poir.

best houses and are in general the most prosperous of all these people in Mindoro. Those of Abra de Ilog and the Bakó River live in rude little huts which usually have no sides. The eaves are so near the floor of the hut that sides are really not necessary. The floor is from 30 centimeters to 2 meters above the ground, and is made either of small poles or of the bark of trees. Buri palm leaves are used to make the roof. Many of these houses are so low that a white man can not stand erect in them except in the center under the highest part of the roof. When the floor is more than 1 meter above the ground, the hut is entered by means of a notched log or by 2 small logs laid in the form of an  along one side of the house. Even these simple houses may be occupied for several years.

For lights the Mangyans use a resin from a tree known as *palsahingen*.* This resin is wrapped in a green leaf of the buri palm. The use of this kind of light is widespread in the Philippines.

PHYSICAL APPEARANCE.

There is much difference in the appearance of the Mangyans in different parts of Mindoro. Some are large and well developed and appear like Christian Filipinos; others are small with slight physical development; while a few show signs of having Negrito blood.

Practically all the Mangyans have blackened teeth. This condition is a result of the continual chewing of betel-nut. Occasionally, a man is seen who has white teeth. This is a person who, for some reason, does not care to chew betel-nut and whose teeth have in consequence remained the natural color.

The Mangyans near Bulalakao are as large and have as good physiques as the average Christian Filipino. The women seem to be less well developed than the men. This may easily be because of the fact that they marry while still very young, sometimes when they have hardly passed out of girlhood. Many of them, too, work hard.

If these Mangyans were to dress and live as do the Christian Filipinos, it would not be possible to distinguish one from the other. The same can not be said of all the people of the interior.

* *Canarium villosum* F.-Vill. This is a large tree of the *Burseraceae* which furnishes great quantities of resin. In Camarines Province, Luzon, torches are made of this resin and are called *sátong*, the Bikol equivalent of Tagalog *sáking*, pitch, resin.

Some of them are as well developed as the people near Bulalakao, but others are small and thin and poorly nourished. As there is no evidence of Negrito blood among them, their slight development may be ascribed to lack of nourishment.

Dr. Fletcher Gardner, who saw much of these people while he was stationed at Bulalakao, says of them:¹

In appearance the Hampangan Mangyans are pure Malay, of rather small stature, of rather light color, often plump, well formed, and, by Malay standards, good looking. The hair is usually straight, rarely wavy, and never very curly or kinky. The teeth are usually black and worn, from constant use of betel-nut, without cleansing, a fact that led Lander to state that they file and blacken their teeth. The use of betel-nut begins very early among them, so that the appearance described may often be observed in comparatively young persons. They tattoo the body.

Some of the Mangyans in the Bakó region show evidence of Negrito blood. Curly hair is not uncommon and even closely curled hair may be seen. Sometimes, too, one sees the large, round, typical eyes of the Negrito. A few Mangyans have beard enough so that they sometimes shave with a jack-knife.

If, as seems very likely, there is some Negrito blood in the Mangyans of the Bakó region, this fact would account for the small stature which is common among the people there.

I made inquiries among these people in various parts of Mindoro to find out if they had any tradition of the former presence of Negritos among them,² but was invariably told that they had never known of any Negritos in Mindoro. The appearance of some of the Mangyans makes me believe that there were formerly Negritos in the island. Also, I made careful inquiries about the existence of white people among them, and always received an incredulous denial. The white tribe, I have no doubt, is a myth, which may have been founded on the occurrence of one or of a few albinos among the Mangyans.

I attempted to trace to its origin the story of people with tails. As might be expected, I learned nothing tending to establish its truth.³ This is a story which is by no means con-

¹ Unpublished manuscript in the division of ethnology, Bureau of Science.

² Lisboa, *Vocabulario de la lengua Bicol* (written between 1594 and 1618), says: "Mangyan. Negrillos mas bosales que los demas." The Spanish dictionary gives *bozal* (not *bosal*, but confusion between *s* and *z* is common in Lisboa) as "stupid." This indicates that in Lisboa's time Negritos were believed to exist in the Mangyan territory although probably at that time there were Mangyans elsewhere than in Mindoro.

³ According to Gardner (unpublished manuscript), the Mangyans, who live near the coast, as well as some Christian Filipinos hold the belief that the Bangon Mangyans, living near Bongabong, have tails.

fined to Mindoro. Eight years ago, when I was at Sablayan on the west coast of Mindoro, I was told that there were people with tails living near by. I visited the house where they were said to live and saw one woman who had a large malignant growth at the end of the spinal column. Of course, the existence of one such person is sufficient foundation for a story that there are people with tails. Whether the story in Mindoro has any more foundation than this I am unable to say, but I doubt if it has.

DRESS.

Near Bulalakao the Mangyan men all wear loin-cloths as the principal item of their dress. These are almost invariably made of white cotton cloth. The cotton is raised, spun into thread, and woven into cloth by the people themselves. The ends of the loin-cloths are embroidered with red and blue cotton yarn. The men usually wear also a short jacket made of the same kind of cloth as the loin-cloths. These are sometimes dyed blue, but are more often white. They are embroidered with red and blue cotton yarn around the lower edge, the neck, and wrists, along the two front edges, along the outer seam of each sleeve, and along the middle seam in the back. Aside from this embroidery, the jacket is entirely plain. The outer seam of each sleeve is sewed at intervals only and presents a kind of slashed effect.

Besides the cord to which the loin-cloth is attached, a belt is worn around the waist. It is made of *buri* 8 to 10 centimeters wide in the middle and tapering to a small loop at one end and a wooden button at the other. The wide middle part has a pocket in which betel-nuts, tobacco, money, and other small articles are carried. In the interior of Mindoro and near Abra de Ilog these pocket belts are of the same style, but are only 3 or 4 centimeters wide in the middle.

Strings of beads are worn around the neck, sometimes in such quantities as to weigh several pounds. I saw one man with coils of copper wire around the neck. A few men wear short strings of beads suspended from the ear lobes and a few strings around the calves of the legs.

The hair is worn long, gathered in a knot low on the back of the head. Around the head, a red cloth is usually worn which serves to keep the hair in place both in front and behind. This is the rule near Bulalakao, but the Mangyans elsewhere, notably near Abra de Ilog and Lake Nauhan, wear the hair short. The men and less often the women wear armlets on the upper arm

made of black and red rattan. These are sometimes worn alone and sometimes are used to hold in place the sweet-smelling roots and the cocks' feathers which they, especially the young men, like to wear.

The women wear a cloth about the loins tucked in at the waist and reaching just below the knees. This is of native-grown cotton and is often dyed dark blue. They also wear a belt, woven of *nito*,¹⁰ 8 to 10 centimeters wide around the abdomen and often another similar band to cover the breasts. At times, instead of the breast band, they wear a short cotton jacket which differs from that worn by the men in some details. It has no opening either in front or in the back, the seams of the sleeves are entirely sewed up, and the only embroidery is around the wrists.

For decoration the women wear masses of beads around the neck and great quantities of strips of rattan dyed red wound around the abdomen. The hair is gathered in a knot at the back of the head, and around it is worn a circular band made of *nito*, rattan, and *buri*, in black, red, and white respectively. Strings of beads or bands of brass wire are sometimes worn around the wrists, and ear plugs are inserted in the lobes of the ears.

Among the Mangyans in other parts of Mindoro no striking variation in the dress of the men occurs. Nowhere else save near Bulalakao is any native-made cotton cloth seen, and nowhere else are the jackets made in the native style. The loin cloths are made either of tree bark or of European cloth. Jackets are either not worn or, if worn, are of the Christian Filipino style. The pocket belt is only 4 centimeters wide instead of 8 or 10. Very few beads are worn except by the Mangyans near Bulalakao.

The dress of the Mangyan women varies much from one part of Mindoro to another. Near Abra de Ilog a cloth is wrapped around the waist and under this cloth a woven band of *nito* is worn. The women also wear a loin-cloth under the skirt, but neither a jacket nor a *nito* breast band, and sometimes they have rings on their hands and grasses thrust through a hole in the lobe of the ear. In this region they neither weave cloth nor use bark cloth. They get cloth either by working for the Christian Filipinos or by exchanging forest products for it. In the Bakó River region, on the other hand, they either buy cloth from the Christian Filipinos or use beaten bark.

Along the Bakó River it is the exception rather than the

¹⁰ *Lygodium circinnatum* Sw

rule to see a woman with a cloth around the loins. Her ordinary costume is a loin-cloth of beaten bark, a great mass of woven *nito* and rattan wound around the abdomen, and a breast band of *nito* and *buri*. The latter is not always worn, but no part of the rest of the costume ever is dispensed with. The loin-cloth is short and is passed both in front and behind over two or three of the strands of the woven *nito* which is wrapped about the abdomen. A red kerchief is sometimes worn around the breasts instead of the *buri* band already described.

The age at which children wear clothes varies from about 10 or 11 years near Abra de Ilog to 5 or 6 at other places. Their clothes are the counterpart in miniature of those worn by their parents.

I saw no evidence among the Mangyans anywhere of tattooing or scarification, or of teeth or body mutilations, except perforations of the ears for the suspension or insertion of ornaments.

Hats are rarely worn. Of the few which I saw all but one had been obtained by the Mangyans from their Tagalog neighbors. The one exception, worn by a Mangyan working in a clearing, was hewn out of a single piece of wood. It was made so thin and of such light wood that it weighed very little more than many woven hats.

INDUSTRIES.

The work of the Mangyans is devoted almost entirely to gaining subsistence, but they have a few industries not directly connected with the question of food. None of the people whom I visited make pottery, although I was told there are Mangyans in the hills west of Bongabong from whom cooking vessels are sometimes obtained. They get most of the pottery vessels which they use from the Christian Filipinos in exchange for *camotes*, maize, *palai*, and bananas.

In the vicinity of Bulalakao the Mangyans plant cotton. The process of converting this into cloth may be described briefly as follows:

The first task in preparing the cotton for weaving is the removal of the seeds. A woman takes a small, hard, smooth piece of wood about 50 centimeters long by 15 centimeters wide and a piece of smooth bamboo about 40 centimeters long and 3 centimeters in diameter. She places the piece of wood on the floor or on the ground and kneels in front of it with a basket of cotton at her side. Then she takes a little of the cotton from the basket, places it on the piece of wood, and rolls the bamboo over

the fiber, forcing the seeds ahead of the roller and out of the cotton.

After the seeds are all removed, the cotton is spread out on a mat, and several people sit on the floor around it and beat it with flexible sticks. This is done to detach the fibers one from another so that the cotton can be readily spun into a thread.

The fiber is next wrapped in a piece of dry hemp or banana stalk and is ready to be spun. The bundle of cotton is held in the left hand, a little is drawn out with the right, and is attached to the spindle which is held in the right hand. A stone whorl is fastened to the lower end of the spindle to keep the latter revolving when once it has been set in motion.

After the cotton has been fastened to the spindle, the latter is set revolving rapidly and the left hand holding the material is gradually raised as high as the spinner can reach. After the thread has been sufficiently twisted, the left hand is slowly lowered, the thread is wound around the spindle, and the process is repeated. It only remains to weave the thread into cloth. This cloth is about 15 centimeters wide for loin-cloths and about 50 centimeters for jackets, blankets, etc.

In no other part of Mindoro did I see any cotton growing nor any evidence that the people are in the habit of weaving cloth.

Near Bulalakao, also, the Mangyans make many neat little baskets of *buri* and *nito*. Some of them are bags designed to be worn on the person for carrying betel-nuts, tobacco, lime, or other things. These are flexible. Others are octagonal in shape, often with two of the sides much larger than the others. They vary from 7 to 18 centimeters in extreme length and from 3 to 10 centimeters in depth. They have a close-fitting cover which is as deep as the basket itself and which has a cylindrical extension in the center of the top which serves as a handle. This handle is usually about 2 centimeters in diameter and 5 centimeters high. It is stuffed with cotton to give it some rigidity. The baskets are made in two and sometimes in three colors, white, black, and red. The white is of *buri*, the black of *nito*, and the red of dyed bamboo. The Mangyans occasionally make small, flat, telescope baskets for carrying betel-nuts, tobacco, and similar articles. These are about 14 centimeters in length, 10 centimeters in breadth, and 3 centimeters in thickness, and are made of *buri*.

The Mangyans everywhere make a few household baskets and a few for bringing home *camotes* and other field products, but they do not make them in great quantities.

AGRICULTURE AND FOOD SUPPLY.

All over Mindoro the Mangyans are agriculturists. Of course, they catch a few birds and occasionally kill a wild hog with lances or catch a *tamarao*,¹¹ a hog, or a carabao in a snare, but by far the greater part of their food supply comes from cultivation of the soil. They follow the *kainyin*¹² system as do also most of their Christian neighbors; that is, they make a new clearing every year or at the most every two years, in which they plant rice. The Mangyans know and value American axes highly. When they have them, they use them in making clearings. When they have no axes, *bolos*¹³ are used for clearing the ground of brush and trees. Even large trees are cut down. When the brushwood is dry it is piled up and burned. The rice is planted by making small holes in the ground with a pointed stick and dropping 2 or 3 grains of rice into each hole. As one passes through a field which has been planted a week or ten days before, he notices grains of rice lying on the ground uncovered. Probably for this reason a considerable percentage of the grain does not sprout.

Sometimes these clearings for rice are on level or rolling land, as at Badyang and along the Bakó River; at other times on the steepest of hillsides, as in the interior of Mindoro and near Abra de Ilog. Whether the land be steep, rolling, or level, the unirrigated type of rice is always planted. Throughout Mindoro, among the Mangyans, the crop is rarely, if ever, sufficiently abundant so that the rice lasts from one harvest to another.

In planting, the men make the little holes for the grains and the women drop the seeds. The sticks used in this work are placed together standing near the center of the clearings after the planting is done. The Mangyans say that they do this to protect the rice from the spirits in the ground whom they have never seen, but who really exist according to the statements of the old people. If these sticks are left lying on the ground, the rice will fall down. This they say they learned from the Tagalogs.

¹¹ *Bubalus mindorensis* Heude.

¹² A word which describes a common Philippine custom of clearing a piece of ground, turning it over, and cultivating it for two or three years until the weeds and grass become thick. This land is then abandoned and another similar clearing made elsewhere.

¹³ A common name throughout the Philippines for the ordinary large working knife. See footnote under "*bolo*" in Schneider's Notes on the Mangyan Language, this number.

Another principal item in their food supply is *camotes*. These grow rapidly without much care and yield abundantly. A *camote* field once set out may be used for two or three years, while as a rule but one crop of rice is obtained from a clearing. When the time again comes for planting, the grass is so thick in the clearing of the year before that it is easier to make a new clearing than to get rid of the grass in the old one.

At Piña, Burabud,¹⁴ and Badyang near Bulalakao, there seems to be a tendency to establish permanent settlements and cultivate old clearings. I have no doubt that if the people had a few simple agricultural implements to enable them to keep the ground free from grass and weeds, this tendency would develop, and after a short time there would be settled communities at these places.

Along the Bakó River and near Abra de Ilog no such tendency is apparent. Great numbers of clearings on the side of Mount Halcon may be seen from the sea. These in all probability have been made by Mangyans, but have become overgrown with cogon grass and are no longer used for planting crops. A small body of Mangyans making new clearings every year or two would soon clear a large area of forested land.

In addition to rice and *camotes*, the Mangyans plant yams (*ubi*),¹⁵ taro (*gabi*),¹⁶ squash, bananas, and beans. They have also papayas.¹⁷ When I was at Dangas and Piña, the people seemed to have enough to eat, although they had no rice. At Burabud, however, they had very little. Storms had destroyed their banana plants and the hot sun had prevented their *camotes* from maturing. They had a few yams and occasionally found a bunch of bananas which, although still green, were far enough advanced so that they could be cooked and eaten. These people lived near the ocean and caught some fish. This was of great help, especially in a time of shortage.

There is little else about their agriculture which calls for comment. When supplies of food fail or run low, the Mangyans go into the forest and gather various edible roots. One of these which they call *korót* (the *nami* of the Tagalogs)¹⁸ is said to require soaking three days in salt water and three in fresh before

¹⁴ Burabud in Bikol signifies "spring."

¹⁵ *Dioscorea alata* L.

¹⁶ *Colocasia antiquorum* Schott.

¹⁷ *Carica papaya* L.

¹⁸ *Discorea daemona* Roxb. See also Reed, W. A., Negritos of Zambales. *Pub. Phil. Ethnol. Surv.* (1905), 2, 40.

it is fit to eat. It is then sometimes dried and pounded and sometimes cooked without drying.

One of the most prosperous settlements in Mindoro from the point of view of food supply is known as Ak-si-gang near Abra de Ilog. About 24 people live here and it has been their home for six years. One man has 13 coconut trees almost ready to bear fruit and 50 more which are three years old; he also has 30 breadfruit trees all bearing. The people of this settlement also plant the customary crops, rice, *camote*, maize, taro, yams, squash, beans, papayas, and lemons. They say they use the last as medicine for fevers. They catch wild hogs and deer with spring traps and lassos. They keep hogs to kill, and eat chickens, eggs, and honey.

The people at Aluyan, a small settlement near Abra de Ilog, say that they kill fish with a poison known as *tuba kamisa*, the croton oil plant.¹⁰ They crush this poisonous fruit and throw it into the water; the fish soon become stupified and are easily taken. They also catch monkeys for food by means of snares set in the trees. Some of them eat iguanas and some do not.

Mangyan methods of cooking are common all over the Philippines so far as my observation goes; however, these people do not use the earthenware stoves or fireplaces which are employed by the Christians. They cook by placing the cooking vessel on 3 stones over a fire. The people of Aluyan at least know how to cook rice in a joint of bamboo or in the bark of a tree when they have no better vessels.

WEAPONS.

In the settlements near Bulalakao some of the Mangyans make and use simple bows with bamboo-pointed arrows. The latter are poisoned and are used in hunting game. They have lances also with which they hunt wild hogs.

Among the Mangyans on the north coast of Mindoro I saw no bows and arrows. Spears also seemed to be scarce. The people in the Bakó region sometimes use spears, which they get from their Tagalog neighbors, in hunting wild hogs. They say that they are afraid of the *tamarao* and never try to catch it.

FIRE MAKING.

The Mangyans have several ways of making fire. In the settlements near Bulalakao some men carry a flint and steel and tinder for this purpose. Others make fire by the use of two

¹⁰ *Croton tiglium* L.

pieces of bamboo, and still others with a piece of rattan and a piece of bamboo. The second of the three methods may be described as follows:²⁰

One edge of a piece of bamboo is sharpened. It is then firmly fastened at an angle of about 45° with the lower end away from the operator. It may be fastened against a post in such a way that the man who is to use it can, by putting one arm on either side of the post, bring the weight of his body as well as muscular force into play. On the convex side of another similar piece of bamboo a shallow groove is cut; on the concave side, at right angles to the groove on the convex side, another is cut until a small hole is made where the two grooves intersect. A few fine shavings are scraped off the bamboo, placed in the groove on the concave side so as to cover the small hole, and held pressed together. This second piece of bamboo is then held firmly in the two hands, the groove on the convex side is placed on the sharpened edge of the other piece, and the bamboo is rubbed rapidly backward and forward and at the same time is pressed down hard. In a few seconds smoke issues from the point of contact of the two pieces and soon the fine shavings are afire. This is the method in use near Bulalakao.

In the Bakó region practically every man met with, and some women as well, wears on the left upper arm 1 or 2 or 3 armlets of rattan. These appear ornamental, but are used in making fire. A piece of dry wood about 3 centimeters in diameter is selected, one end of it is split for a distance of 12 to 14 centimeters and a plug is put in to keep the slit open. A few shavings are then put tightly into the slit where it is narrow. One of the armlets is taken from the arm, unwound, and passed around the split stick just under the shavings. The split stick is held firmly on the ground with the two feet and the rattan is drawn rapidly backward and forward until the shavings ignite. A few seconds usually are sufficient.

I have seen no other method of making fire in Mindoro excepting, of course, by the use of matches. The Mangyans are acquainted with matches and like them.

FAMILY LIFE.

Only long acquaintance with the Mangyans would enable the observer to know well their family life. As a rule I have no

²⁰ Compare also fire-making methods in use among the Negritos of Zambales. Reed, *Negritos of Zambales*, *loc. cit.*, 40.

doubt that as among most people monogamy prevails and that the man and woman are faithful to each other, but at various places throughout the Mangyan area I met men who had two wives. As nearly as I could find out the principal reason for this was in order that the man might have two women to work for him instead of only one.

On the Bakó River in one settlement I was told that a man sometimes has two wives. In another settlement not far from the first the people said that a man married only one woman whom he never deserted; an unfaithful man or woman was punished by a beating by the old people. At still another settlement a man was married to two women who were sisters. The first had no objection to the man marrying the second. From the occurrence of cases of polygamy at widely separated points in the Mangyan territory and from the fact that inquiries made in the short time I was among them brought to light several such cases, I am inclined to infer that the practice is not uncommon.

Marriage is rare between Mangyans and Christian Filipinos. It is probable that the Christians have some prejudice against marrying Mangyans. Whether the latter in general object to such mixed marriages I am unable to say. One Mangyan told me that if they were to marry with the Christians both parties to the marriage would fall ill. I think it is likely that at some time in the past a Christian Filipino and a Mangyan woman married, and that the woman caught some infection from the man. The existence of a tradition that serious illness will follow a marriage between the two people is difficult to explain except by some such hypothesis as this.²¹

The names of both men and women in some parts of the

²¹ "The largest social unit seems to be the family, and all the people living in a *rancheria* will usually be found to be related either by blood or marriage. The head of this loose aggregation will almost always be the oldest man, the only exception being when he is too feeble to take any part in the government of the *rancheria*, when his duties are taken by the next oldest, although even then his counsel will be listened to with respect. The chiefship, if it amounts to such, is not hereditary. The powers of the chief are also quite limited. Disputes are settled by a council of the old men of the same or neighboring *rancherias*, and the decisions of these courts are looked on as final."

The above is from the manuscript of Dr. Fletcher Gardner on the Hampangan Mangyans of Mindoro. These are the people near Bulalakao. It is probable that a similar form of social organization may be found among Mangyans elsewhere in the island.

Mangyan country seem to be but little used, as in calling a person they do not use the name, but merely a call to attract attention. Men sometimes do not even know their wives' names, if one may believe what they say. However, I suspect that this is not true. The statement was probably made for fear that they would be asked to give their wives' names and from a reluctance to do so.

CHILDREN.

Children are usually born in the house where the parents live. No special house is built for the prospective mother. The father is often present at the birth but it is the old women who assist the mother. Many children are still-born, and the mother, too, often dies. Twins are sometimes born, but the people told me they had never heard of triplets.

Gardner says of the Hampangan Mangyans that—

Infanticide by burial alive is allowed and even considered praiseworthy in time of scarcity, and is defended on the ground that the mother who suckles her child will most probably die, but if she has all her strength and time to give to the search for food, she will probably live.

The people near Abra de Ilog say that infanticide is never practised. They say they want children.

Circumcision is not common among the Mangyans, but there are those near Abra de Ilog who practise it. The operation is performed with a knife or a *bolo*, and at any time between the ages of 1 and 14. They say that the operation is for the greater convenience of a man after marriage. I was told that the boys suffer no ill effects as a result of it.

DEATH AND BURIAL.

At several places the Mangyans said that they were formerly more numerous than now. Near Abra de Ilog many have died from hæmorrhage of the lungs and from small-pox, but not from cholera. They do not seem to be a prolific people.

Burial customs vary widely from place to place. At Burabud in a small jagged cave in a limestone cliff were the remains of 8 people (3 children and 5 adults) wrapped in their clothes and laid on small bamboo platforms. This was the burial place of one family. The man whose relatives were buried here said that this place was for his family only and that he did not know where other people put their dead. It does not seem likely that the latter part of this statement is true. In this place it is customary to bury a dead person for a year, then to

dig up the bones, wrap them in the clothes formerly belonging to the dead person, and, together with the beads, baskets, and other things which were his, to place them in some rocky cave or on a cliff.

At Abra de Ilog the dead are buried at some place near by, the grave is surrounded with a good fence, and a few days later the people move away from the place. The clothes and everything else belonging to the dead person are buried with him; he is not put on a cliff nor in a cave.

At Aluyan the people say that after a death and before they abandon the place where they have lived, they burn the house because there are many *bu-kau*, malignant spirits, near by. In all the trees and paths near where the person died they put lassos so that the spirits can not pass.

About Lake Nauhan the dead are buried a long distance from the place where the people live. They do not abandon their houses after a death. For the burial they select a place which is well drained so that when the rains are heavy it will not become muddy.

In the Bakó region, when a person dies, the people at once abandon the place even though the crop is about ready to be gathered, and they do not return for perhaps five years.

The Mangyans at Aluyan say that if one of their number falls ill of small-pox they all leave him; even the mother deserts the sick person, although the father sometimes remains. If they hear of small-pox among the Christians in town, they move to some distant place and send word to the Christian people not to come to them.

RELATIONS WITH CHRISTIAN FILIPINOS.

With the exception of the people of the interior, all the Mangyans of Mindoro seem to be on friendly terms with the Christian Filipinos. From the association between the two peoples, the latter appear to be by far the greater gainers. The Christian people of Bulalakao, according to the statement of some of their own number, practically live on the labor of the Mangyans. The latter do not often bring to town their products, but the people of the towns go out to the Mangyan settlements, taking with them cloth, *bolos*, beads, and other cheap merchandise which the Mangyan wants and which they exchange for maize, *camotes*, bananas, and other food products. Some of the Mangyans are also employed by the townspeople in making clearings. They are rarely, if ever, paid in cash for such services. Rice, if they

happen to need it, cloth, cooking vessels, and *bolos* are the most common forms of payment.

The Mangyans near Abra de Ilog are less prosperous than those near Bulalakao. The consequence of this condition and, perhaps also, to some extent the reason for it is that they have come to be more dependent on their Christian neighbors by whom they are often employed. Their labor consists in making clearings, planting and harvesting crops, and getting out logs for timber.

For cutting down trees and hewing out logs I was told that 3 Mangyans for two days' work received an American ax and a *bolo*. If this information was correct, the Mangyans were being paid about 50 centavos per day each. Even if in a few cases they were paid so much, it is extremely doubtful if as a rule they receive more than the equivalent of one-half this amount.

DIVISIONS AMONG THE MANGYANS.

I have referred already to the Bangons and the Bukils. The former are said to live in the interior of Mindoro, the latter between the Bangons and the coast Mangyans. It is reported that some of the Bangons live during certain months of the year in holes in the mountain side and that they keep young pythons until they have grown to a suitable size, when they kill and eat them. They are said also to eat lizards and rats. All this information about a people in the interior, who are rarely seen and of whom the coast people are afraid, has to be accepted with many reservations. On the two trips I have made across Mindoro, I have seen no signs of cave dwellings nor of any people who differ in any marked details of dress or mode of life from the coast Mangyans.

The fact that there is a considerable difference between the dialects of the interior and of the coast people indicates that even if the two are fundamentally one they have had little to do with each other for so long that their dialects present marked divergences. There is a slight difference of speech between places as near together as Mamburao on the west and Abra de Ilog on the north coast. The fear which the people of the interior have of strangers shows that they rarely, if ever, leave the hills where they live.

I think it is more probable than otherwise that all the pagan people of Mindoro belong to one tribe, with customs much alike everywhere, but with dialectic variations from one section to another due to long separation and lack of intercourse.

LANGUAGE.

The language of the coast Mangyans at least belongs to the Philippine family of languages. This is clearly shown by the study of the brief vocabularies which I collected, made by Mr. Schneider of the Bureau of Forestry.²²

One of the most interesting things about the Mangyans is the existence among a certain small section of them of an ancient system of writing. I made careful inquiries everywhere I went among them for people who knew how to write. I found them in only two settlements near Bulalakao and in no other part of the Mangyan country.²³ I heard of one man at a settlement also near Bulalakao who could write.

Even in the places where the ability to write is found, it is by no means a universal accomplishment. At Dangas there were two people who knew how to write and at Budburan there were seven, two of them women, but not all of these nine people could write readily. Naturally, since the ability to write is not widespread, no great use can be made of it. However, writing occasionally is employed in sending a message from one place to another. These messages are usually written with a knife on a node of bamboo or on a split piece of a node.

Whatever may have been the practice in the other Philippine systems of writing formerly in use, the Mangyans at the present time write horizontally from left to right.²⁴

A comparison of the Mangyan writing with the systems in use at the time of the arrival of the Spaniards among the Iloko, Tagalog, Pampanga, Pangasinan, and Bisaya peoples reveals a close resemblance in general character and in some of the symbols used. Only three of these symbols represent letters, all the others syllables, so that the series of characters is a syllabary rather than an alphabet. The three letters which are represented by symbols are the vowels *a*, *e* or *i*, *o* or *u*. The simplest form of the other characters represents the various

²² This number, p. 157.

²³ Mr. R. C. McGregor of the Bureau of Science informs me that he knew a man on the Bakó River who could write on bamboo.

²⁴ T. H. Pardo de Tavera has shown in his pamphlet, *Contribución para el estudio de los antiguos alfabetos filipinos*, that it is very unlikely that the ancient Filipinos originally wrote from below upward and that under the influence of Spanish writing they changed to a horizontal left to right order. The Mangyans probably came very little under Spanish influence and the fact that they now write horizontally from left to right supports Tavera's contention. On the other hand Lisboa says: "Porque ellos [the Bikols] escriben y leen de abajo hacia arriba."

consonants together with the vowel *a*. These characters represent the syllables *ba, da, ga, ka, la, ma, na*, etc. The addition of a short mark, usually a straight line, above these characters changes the vowel to *e* or *i*, so that we would have *bi, di, ki, li, mi, ni*, etc. The placing of the same short mark below the character gives the vowel value *o* or *u*, and we would have *bo, do, go, ko, lo, mo, no*, etc.

Certain inconveniences and inaccuracies in such a system of writing are apparent. Neither a combination of consonants nor a terminal consonant can be represented, but only a single consonant followed by a single vowel. For example a Mangyan who was writing for me on a piece of bamboo had occasion to use the Spanish word "trabajo." This he represented by the characters for *ta-ra-ba-ho*. "Salamat," the common Filipino word for thank you, is written *sa-la-ma*, the final consonant not being represented. "Barrio" appears as *ba-yo*, "Agosto," as *a-go-to*, and so on.

These facts, for a person familiar with the system of writing, make it much easier to write than to read it.²⁵

There is nothing strange in the fact that the Mangyans, one of the least advanced of all the people of the Philippines, should have a native system of writing, while all the other people of the Islands who can write at all, with the exception of the Tagbanwas of Palawan, use the Roman alphabet.

When it is remembered that at the time of the arrival of the Spaniards there were systems of writing in use among the Ilokos, the Pampangas, the Pangasinans, the Tagalogs, and the Bisayas, and probably also among the Mangyans and Tagbanwas, and when the great advantages which an alphabet presents over a syllabary are considered, it is not surprising that those Filipinos who came most in contact with the Spaniards abandoned their old systems in favor of the Roman alphabet, while those who were remote from Spanish influence continued to use them, even down to the present day.²⁶

²⁵ T. H. Pardo de Tavera, *op. cit.*, points out that in the ancient Tagalog writing two characters for *le* or *li* following each other might be read *lilí, lilín, lilip, liliís, lilim, liliíc, liglig*. The characters for *ba* and *ta* might be read *bata, batang, batas, banta, bantay*.

²⁶ I hope to have within a few months some additional data on Mangyan writing and to publish a more detailed account of it than is possible at the present time.

ILLUSTRATIONS.

PLATE I.

Group of Mangyan men and girls, near Bulalakao, Mindoro. (Photograph by Martin)

PLATE II.

- FIG. 1. Mangyan man, near Bulalakao. (Photograph by Martin.)
2. Mangyan man, Bakó River, Mindoro; hair shows evidence of Negrito blood; armlet on right arm is for holding feathers or fragrant herbs, that on the left arm is rattan for making fire. (Photograph by Martin.)
3. Mangyan man, near Bulalakao. Note slashed sleeves. (Photograph by Miller.)
4. Mangyan girl, near Bulalakao, wearing breast band. (Photograph by Martin.)

PLATE III.

- FIG. 1. Mangyan man, near Bulalakao. Note slashed sleeves, pocket belt, and loin-cloth. (Photograph by Miller.)
2. Mangyan man, near Abra de Ilog, in typical costume. (Photograph by Miller.)

PLATE IV.

- FIG. 1. Mangyan woman, Bakó River, wearing braided *nito* over the abdomen and a loin-cloth. (Photograph by Miller.)
2. Mangyan woman, Bakó River, in typical costume. (Photograph by Miller.)

PLATE V.

- FIG. 1. Jacket and loin-cloth of native-grown cotton worn by Mangyan men, near Bulalakao. (Photograph by Cortes.)
2. Baskets made by Mangyans; the smaller ones are made by the people near Bulalakao, the larger one by those of the Bakó River. (Photograph by Cortes.)

PLATE VI.

- FIG. 1. Jacket, of native-grown cotton, worn by Mangyan women near Bulalakao, and loin-cloth of beaten bark, worn by Mangyan women of the Bakó River. (Photograph by Cortes.)
2. A, Braided *nito*. B, Strips of bamboo dyed red. C, Breast band made of *buri* and *nito*. D and E, *Nito* abdominal or breast bands. F, Head band. (Photograph by Cortes.)

MILLER.

PLATE VII.

1. Mangyan woman, near Bulalakao, rolling seeds out of cotton fiber. (Photograph by Miller.)
2. Beating cotton to separate the fibers. (Photograph by Miller.)

PLATE VIII.

zyan woman, near Bulalakao, spinning cotton thread. (Photograph by Miller.)

PLATE IX.

1. Better class of Mangyan house, near Bulalakao. (Photograph by Miller.)
2. Group of Mangyan houses, Bakó River. (Photograph by Miller.)

PLATE X.

1. Typical Mangyan clearing already planted. (Photograph by Miller.)
2. Rattan bridge built by Mangyans across Amnai River, near Sablayan, Mindoro. (Photograph by Martin.)



PLATE I. MANGYAN MEN AND GIRLS, NEAR BULALAKAO.



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.

PLATE II. MANGYANS OF THE BAKO RIVER AND OF BULALAKAO.



Fig. 1. Mangyan man, near Bulalakao.



Fig. 2. Mangyan man, near Abra de Ilog.

PLATE III.



Fig. 1.



Fig. 2.

PLATE IV. MANGYAN WOMEN OF THE BAKO RIVER.

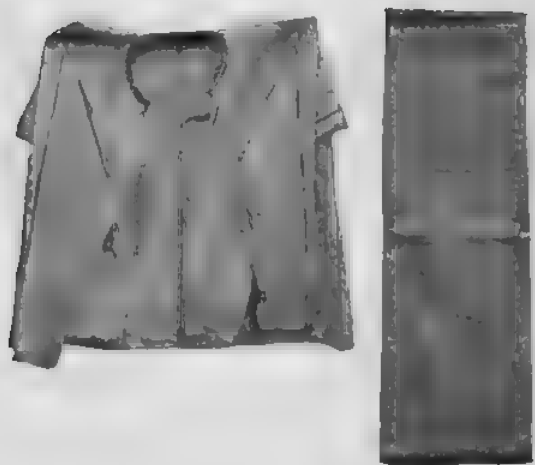


Fig. 1. Jacket and loin cloth.



Fig. 2. Mangyan baskets.

PLATE V.

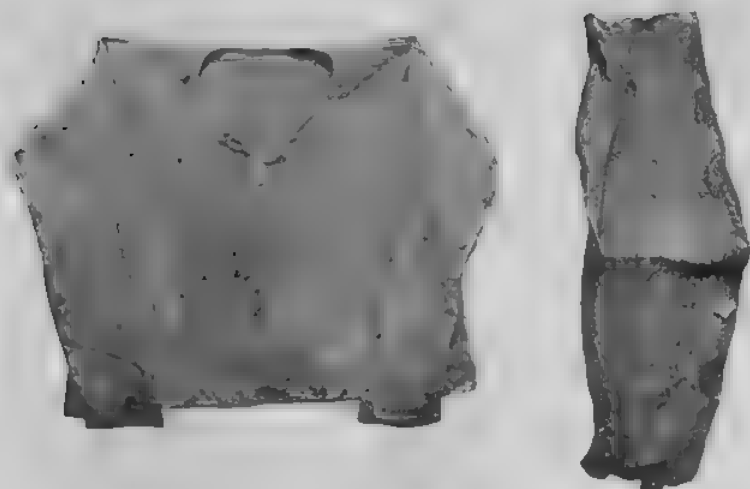


Fig. 1. Jacket and loin cloth.

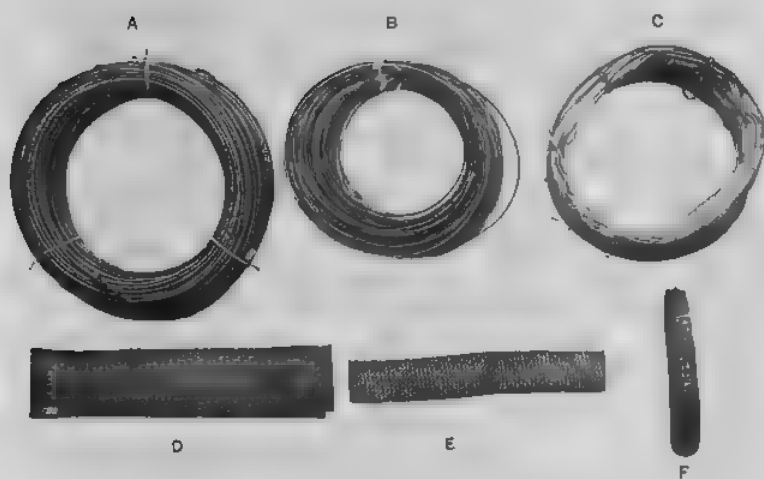


Fig. 2. Articles of dress made of burl, nito, and bamboo fiber.

PLATE VI.



Fig. 1. Rolling seeds from cotton fiber.



Fig. 2. Beating cotton fiber.

PLATE VII.



PLATE VIII. MANGYAN WOMAN, NEAR BULALAKAO, SPINNING COTTON THREAD.



Fig. 1. Mangyan house near Bulalakao.



Fig. 2. Mangyan houses, Bako River.

PLATE IX.



Fig. 1. Typical Mangyan clearing already planted



Fig. 2. Rattan bridge built by Mangyans, near Sablayan.

PLATE X.

NOTES ON THE MANGYAN LANGUAGE.

By E. E. SCHNEIDER.

(From the Bureau of Forestry, Manila, P. I.)

The following vocabularies were collected by Doctor Miller in three different regions of Mindoro: Bulalakao, Abra de Ilog, and Nauhan.* The Mangyans of Bulalakao live among the foothills some distance inland from the town; those of Abra de Ilog scattered about the basin of the Ilog or Tuai River; and those of Nauhan on the shores of Lake Nauhan, some 15 to 25 kilometers from the town of the same name. Doctor Miller's interpreter was a Tagalog, a native of Bulalakao, who possessed a good working knowledge of English. With the exception of a few errors, which are commented on in the notes, I believe this list may be relied on as representing correctly the speech of those Mangyans among whom they were collected.

However, it should be noted that there is perhaps an unduly strong element of Tagalog of recent introduction in the Abra de Ilog collection. This is seen most strongly in the numerals, which are practically pure Tagalog throughout, even to the compound words, which latter in the Bulalakao dialect are formed on a system somewhat different from Tagalog, Bikol, and Bisaya. Other instances of Abra de Ilog forms identical with Tagalog, or practically so, while the other two dialects are different, will be found under abdomen, cotton, foot, left, mountain (?), and, in addition to these native words, the corrupt Tag.-Span. *baraso* (Span. *brazo*, arm). It would be strange if one of the Mangyan dialects had exactly the same numerals as Tagalog, but they are the very words that are first picked up in commercial intercourse. Doctor Miller informs me that the Mangyans of Abra de Ilog have probably come more into contact with the Tagalogs than those of any other region.

For convenience of reference, the English words have been arranged in alphabetical order, except the numerals and the names of the individual fingers, the former being given in order at the end of the list and the latter being made to follow the

* This number, p. 135.

generic term *finger*. After each English word, those of the three Mangyan dialects are given in the following order: a, Bulalakao; b, Abra de Ilog; c, Nauhan.

The spelling of the Mangyan words, as well as of those from other languages collected by me directly, is strictly phonetic, the following rules being observed:

a, e, i, o, u have the Latin or "continental" value. (Long and short vowels are not distinguished, except in Ifugao, where short vowels are marked with a circumflex accent.)

ö, similar to, if not identical with, Germ. ö, or Eng. e in *her*; it occurs in a few Mangyan words and has been substituted in this paper for E as used by Christie¹ in Subanun.

b, d, f, h, j, k, l, m, n, p, r, s, t, v, z as in English.

g, always hard, as in *get*.

ñg as in *ringing*; where used without the tilde, n and g are pronounced separately, as in *ingrate*.

ñgg as ng in *finger*.

ch as in *church*.

w as in *water*; used only at the beginning of a word or a syllable.

x as Germ. ch in *loch*.

y as in *yard*; used only at the beginning of a word or a syllable.

The apostrophe (') represents the glottal check, or *hamzat*, (Germ. *Kehlkopfexplosiva*). It will be noticed it does not occur in any Mangyan word here recorded; it undoubtedly exists in the language, but if present in any of the words collected, Doctor Miller did not observe it.

c and qu are not used, being replaced by k.

In order to avoid the confusion incident to citing material written in as many orthographic systems as there are authors, I have reduced all words to the above system, except in doubtful cases where there seemed to be some risk of misrepresenting a word whose true pronunciation I could not learn. Also, in the cases of words like *apúi*, *bábúi*, etc., which are found with the endings -*ui*, -*uy*, -*oi* and -*oy*, and *ólo* or *úlu*, in which is found every possible combination of o and u, I have unified the different spellings to avoid the endless repetition of practically identical forms. This seems to me unobjectionable both because it is well known that o and u are frequently interchangeable even within very limited localities and because the majority of writers have been notoriously careless in the use of these two letters.

¹ *Pub. P. I. Bur. Sci., Div. Ethnol.* (1909), 4, 107.

As the main object of the compilation is to show the probable nearer or more remote relation of Mangyan to the other Philippine languages, forms not closely resembling the Mangyan have as a rule been cited only where no nearly identical ones were found. In cases where no English equivalents are given for the cognate words cited, these are synonymous with the Mangyan, cognate terms not synonymous with Mangyan being followed by English explanations.

In the case of the numerals it has not seemed worth while to collate a mass of material; they are, therefore, simply tabulated, with a few notes in individual cases.² No numerals were collected in the Nauhan dialect.

LANGUAGES AND DIALECTS CITED,³ ABBREVIATIONS OF THEIR NAMES, AND AUTHORITIES CITED.⁴

Ae.-Bat. ⁵	Aéta of Bataan.	{	Reed, W. A., Negritos of Zambales. <i>Pub.</i> <i>Phil. Ethnol. Surv.</i> (1905), 2, pt. I.
Ae.-SF.	Aéta of Sta. Fe, Zambales.		
Ae.-Sub.	Aéta of Subig, Zambales.		

¹An excellent table of numerals in Philippine languages is given by Scheerer, *The Batan Dialect*, following p. 88. *Pub. P. I. Bur. Sci., Div. Ethnol.* (1908), 4, pt. I.

²Besides acknowledging sources from which the word lists are derived, I desire here to express my thanks to Doctor Miller and to Messrs. Scheerer and Beyer for various corrections and suggestions made by them while the manuscript was in preparation.

³The spelling of the names (except Ibanak and Ifugao) follows the list proposed by Conant [*The Names of Philippine Languages, Anthropos*, (1909), 4, No. 5, 6], which has been adopted by the division of ethnology of the Bureau of Science.

⁴It should be kept in mind that all Aeta (i. e., Negrito) dialects so far observed in the Philippines are of Indonesian origin; that is, the Aeta have everywhere adopted the languages of the tribes that surround them. It is quite probable that they have sometimes preserved antiquated forms and in some cases a tribe of Aeta may even have learned their speech from earlier Malayan invaders than those who now surround them. A modern instance of this was suggested to me by Mr. Scheerer: The Aeta of Zambales speak a corrupt Sambali, but Sambali is being supplanted by Iloko, Pangasinan, and Tagalog (see Reed, *op. cit.*, pp. 27, 28). When Sambali becomes obsolete in the plains, which it almost certainly will long before it does in the hills, the Aeta will be speaking an otherwise lost language. Moreover, it is quite certain that each Philippine language, where adopted by the Aeta, has suffered a considerable number of changes in pronunciation and even of inflection, but it remains essentially Indonesian. It is not, of course, impossible that original Aeta words may have survived occasionally, for instance in topographical names and names of plants.

- Ban. Banawi. Schadenberg, A., cited by Scheerer, O. The Batán Dialect, etc. *Pub. P. I. Bur. Sci., Div. Ethnol.* (1908), 4, pt. I.
- Bgb. Bagobo. Gisbert, M. *Diccionario español-bagobo*, cited by Scheerer. Some words from the same source added by J. M. Garvan.
- Bis.-A. Bisaya of Agusan Valley. }
 Bis.-M. Bisaya of Mindanao. } Garvan, of the division of ethnology, Bureau of Science, who has spent several years among the pagan tribes of eastern Mindanao. The first of these dialects is that spoken by the Christian Bisaya settlers in the Agusan Valley and the second the Bisaya spoken (with many local dialectic variations) throughout eastern Mindanao.
- Bis.-I. Bisaya of Iloilo. }
 Bis.-L. Bisaya of Leyte. } From an intelligent domestic servant, a native of Leyte, apparently well acquainted with both dialects.
- Bkl. Bikol. From my own notes on this language.
- Bkl. L. Bikol. Lisboa, Márcos de. *Vocabulario de la Lengua Bicol*.⁹
- Bnu. Banuáon. A tribe distinct from the Manobo, presumably identical with the Bukidnon of Bukidnon Subprovince, Agusan Province. Its habitat is in the mountains west of the lower part of the Agusan River, in Butuan Subprovince, Agusan Province. Words furnished by Mr. J. M. Garvan. (See Bis.-A.)
- Bon. C. Bontok Igorot. Clapp, W. C. A Vocabulary of the Igorot Language, etc. *Pub. P. I. Bur. Sci., Div. Ethnol.* (1908), 5, pt. III.
- Bon. J. Bontok Igorot. Jenks, A. E. The Bontoc Igorot. *Pub. Phil. Ethnol. Surv.* (1905), 1.
- Bon. S. Bontok Igorot. Schadenberg, cited by Scheerer.
- Btn. Batan. Scheerer, *op. cit.*

⁹ I have so distinguished between modern Bikol words and those taken from Lisboa because his dictionary, though first published in 1754, was written about 1590 to 1620, and forms found in it, though now perhaps antiquated or even obsolete, are for that very reason of greater interest. In this connection it should be remarked that not too much weight should be given to the fact that there is so large a Bikol element in the following notes. Merely to look up synonyms is easy in any book of reference, even though one have but little knowledge of the language in question, but the compilation of cognate terms having often quite different meanings is comparatively difficult except in a language with which one is fairly well acquainted.

- Dmg. Dumagat of Bulakan. Simon, E. J. Manuscript of the Ethnological Survey, cited by Reed.
- Form. Formosan, cited by Scheerer.
- Gin. M. Ginaan. Meyer, H., cited by Scheerer.
- Gin. S. Ginaan. Schadenberg, cited by Scheerer.
- Ibk. Ibanak.⁷ Most of the material in this language was furnished me by Mr. Valentin P. Franco, of the Bureau of Forestry, a native of Aparri, Kagayan; some words are from Scheerer, and a few from Nolasco de Medio, P. Fr. Pedro, Gramatica Ibanag-Castellana.
- Ifg. Ifugao. }Furnished by Mr. H. Otley Beyer, division of ethnology, Bureau of Science.⁸
- Sub-Ifg. Sub-Ifugao.]

⁷This name is given as Ibanag (abbrev. Iog.) by Conant, but it is pronounced Ibanak. The reason for this seeming inconsistency is that in this language all original final sonants are pronounced surd, resuming their original value only when a suffix is added. That is, when the compound analogous to *katagalugan*, from *tagalog*, is formed from *ibanak*, it becomes *keb-banag-an*. It seems to me more logical to spell each form as actually pronounced, than to use a spelling that necessitates the constant keeping in mind of a phonetic rule in order to pronounce correctly the written word.

⁸Ifugao is not a native tribal name. It is the name by which the people are known to the Ibanak tribes of Nueva Vizcaya and Isabelá Provinces. It is now applied to all the clans, some 60 in number, that inhabit the Ifugao Subprovince of the Mountain Province. Formerly they called themselves by their clan-names, but they have now learned to call themselves Ifugao, though they pronounce it Ipúgo or Ipúgao. They understand it to mean "fair-complexioned." This is confirmed by comparison with the following terms: Ilk. *púdau*, white; Ib. *fúrau*, white; Bkl. L. *pórau*, white cloth or clothes; Bkl. *púrau*, abaka cloth with no admixture of cotton or silk; Sbn. *púlau*, white abaka cloth; Ting. *napúdau*, white; Bon. J. *impókau*, white; Bon. C. *enpokau*, white; Bon. C. *pulau*, Spanish, Spaniard; Bon. C. *pomokau-ak*, to be clear; Bon. C. *papokawek*, to clean, make white; Ifg. *ipúgo*, *ipúgao*; Sub-Ifg. *ipúko*, *ipúkao*, fair (of complexion) and a variety of white rice.

If we add to this the significant fact that the Ifugao are rather fair, while their neighbors, the Ibanak, are the darkest-skinned of all Filipinos, it seems rather probable that this is the true origin of the name. It was first applied to the whole tribe by P. Buenaventura Campa, Los Mayóyao y la Raza Ifugao. Madrid (1895).

Ifugao is the language of the Kiangnan-Ifugao, Western-Ifugao, and Central-Ifugao Districts; *Sub-Ifugao*, of the Mayaoyao and Alimit Districts. The latter differs from pure Ifugao essentially in its phonetic system.

The name is given by Conant as *Ifugau*, but I am informed by Mr. Beyer, who is my authority for the above facts, that the final sound is a distinct *o*, the *a* and *o* being pronounced clearly and almost separately.

- Ilk. Iloko. Furnished mostly by Mr. V. with the assistance of a native of ; of words cited from Scheerer.
- IN. Indonesian.
- Inb. Inibaloi. Scheerer, O. *The Nat. Phil. Ethnol. Surv.* (1905), 2, 1.
- Klm. Kalamian. Jerónimo de la Virgen. Vocabulario castellano-calamian (Retana, Archivo II), cited by .
- Knk. Kankanai. Lagasca, Mariano. M. Scheerer.
- Lep. Lepanto, Igorot of. Schadenberg. Scheerer.
- Mal. Malay. From various random notation.
- Mda. Mandaya. Furnished by Mr. J. M. Magindanao. Juanmarti, J. D. Magindanao-español, cited by Scheerer.
- Mgy. Mangyan.
- Mnb. Manobo. Furnished by Mr. J. M. Pampanga. Furnished me by Mr. of the Bureau of Education, notes, partly from: Bergaño, D. lengua pampanga. The same of my attention certain words from The Malay Archipelago.
- Pan. Panay, Bisaya of. Lozano, R. panayana, cited by Scheerer.
- Pang. Pangasinan. Macaraeg, A. A. llano-pangasinan; and Pellicano, gua pangasinan, both cited by .
- Phil. Philippine.
- Sbl. Sambali.¹⁰ Furnished me by M. caño, a Sambali from Manila present completing the fourth High School.

⁹For the change from "Nabaloi" to "Ind. Dialect, p. 15.

¹⁰This name is not included in the list of (op. cit.). In another publication [The RGII L. Am. Oriental Soc. (1910-11), 31, pt. 1, 70 and abbreviated Sbl.]; the name of the people and of the

- Ilk. Iloko. Furnished mostly by Mr. Valentin P. Franco, with the assistance of a native of Ilocos; a number of words cited from Scheerer.
- IN. Indonesian.
- Inb. Inibaloi. Scheerer, O. *The Nabaloi Dialect. Pub. Phil. Ethnol. Surv.* (1905), 2, pt. II.⁹
- Klm. Kalamian. Jerónimo de la Virgen de Monserrate. Vocabulario castellano-calamiano. MS. de 1789. (Retana, Archivo II), cited by Scheerer.
- Knk. Kankanai. Lagasca, Mariano. Manuscript, cited by Scheerer.
- Lep. Lepanto, Igorot of. Schadenberg, A., cited by Scheerer.
- Mal. Malay. From various random notes in my possession.
- Mda. Mandaya. Furnished by Mr. J. M. Garvan.
- Mgd. Magindanao. Juanmarti, J. *Diccionario moro-magindanao-español*, cited by Scheerer.
- Mgy. Mangyan.
- Mnb. Manobo. Furnished by Mr. J. M. Garvan.
- Pamp. Pampanga. Furnished me by Mr. Luther Parker, of the Bureau of Education, partly from his own notes, partly from: Bergaño, D. *Vocabulario de la lengua pampanga*. The same gentleman called to my attention certain words from Wallace, A. R. *The Malay Archipelago*.
- Pan. Panay, Bisaya of. Lozano, R. *Cursos de la lengua panayana*, cited by Scheerer.
- Pang. Pangasinan. Macaraeg, A. A. *Vocabulario castellano-pangasinan*; and Pellicer, M. *Arte de la lengua pangasinan*, both cited by Scheerer.
- Phil. Philippine.
- Sbl. Sambali.¹⁰ Furnished me by Mr. Tranquilino Eli-caño, a Sambali from Masinlok, Zambales, at present completing the fourth year in the Manila High School.

⁹For the change from "Nabaloi" to "Inibaloi," see Scheerer, *Batan Dialect*, p. 15.

¹⁰This name is not included in the list of proposed spellings (Conant, *op. cit.*). In another publication [The RGH Law in Phil. Languages, *Journ. Am. Oriental Soc.* (1910-11), 31, pt. 1, 70 and 81] Conant gives "Sambal" abbreviated Sbl.; the name of the people and of the language is Sambali.

- Sbl.-Ae. Sambali-Aeta. }
 Sbl.-Bol. Sambali of Bolinao. } Reed, *op. cit.*
 Sbl.-Iba. Sambali of Iba. }
 Sbn. Subanun, Sindangan River. } Christie, E. B. The Su-
 Sbn.-Dum. Subanun, Dumankilas Bay. } banuns of Sindangan
 Sbn.-NR. Subanun, Nueva Reus. } Bay. *Pub. P. I. Bur.*
Sci., Div. Ethnol. (1909), 6, pt. I.
 Sub-Ifg. See Ifg.
 Sul. Sulu. Haynes, J. H. English, Sulu and Malay Vo-
 cabulary. *Journ. Straits Branch R. A. S.* (1885),
 No. 16, cited by Scheerer.
 Tag. Tagalog. Most of this material collected by myself,
 with the assistance of my family; some words
 from Scheerer.
 Tingg. Tinggian. Meyer, H., cited by Scheerer.
 Tir. Tirurai. Bennasar, G. *Diccionario tiruray-español*,
 cited by Scheerer.
 * The asterisk denotes theoretical forms.

WORD LIST.

1. abdomen; a, *áwak*; b, *pú-son*; c, *buñg-ké*.
 a: Bkl. *háwak*, body; Bis. *háwak*, waist; Bon. J. *áwak*, body; Mnb.,
 Mda., Sbl. *áwak*, waist.
 b: Bkl. *pos'ón*; Bis.-A. *pós'on*; Ibk. *futúñg*; Ilk. *pus'ónñg*; Bon. J.
féto; Bon. C. *poto*; Ifg. *pútu*; Pamp. *púsu*, groin.
 c: No cognate material found.
2. afternoon; a, *ma-lam-buñg*; b, *gi-ra-pu-na-ni*; c, ———.
 a: Bkl. *imbúñg*, warmth (see also hot, sun); Sbn.-NR. *lálabuñg*,
 noon.
 b: Bkl., Bis.-I., Pang., Tag. *hápon*; Klm. *apon*; Bgb. *mapon*; Sbl.
ápon, late afternoon; Pamp. *gatpanápon*; Bkl., Tag. *hápon*,
 to go to roost; Pamp. *ápon*, id.
 For the ending *-ni* see sunset, yesterday; it seems to have
 a sense of a definite point of time.
3. arm; a, *tak-yái*; b, *ba-rá-so*; c, *tak-yái*.
 a, c: Bkl., Ilk. *takyág*; Ibk. *takyák*; Ifg. *taklái* or *taklé*; Btn. *tachai*;
 Sbl. and Ae. *takiái*; Ae.-Bat. *tukiái*; Pamp. *tákdai*.
 b: Evidently only a corruption of Span. *brazo*.

The same form is found in Dr. John Francis Gemelli Careri's report of a voyage around the world, 1693-1697. (Reed *op. cit.*, p. 29, footnote.) Mr. Scheerer says: "The etymology is doubtless: *sañg*, particle denoting unity or totality + *bali* or *balei*, village," which I believe to be correct. The assimilation: *ñg* > *m* before a following labial is extremely common in many Philippine languages.

4. arrow; a, *ud-yúñg*; b, —; c, —.

a: Pamp. *úyúñg*; perhaps also the following: Bon. J. *kayyáñg*, spear; Ifg. *gai'yáñg*, spear; Bkl. *suyyáñg*, sharpened bamboo stakes, "caltrops".

The native name of Orion, Bataan Prov., is *Odyúñg* or *Udyúñg*; there is a town named *Odioñgán* in Tablas, a sitio of the same name in Sagñay, Camarines, and a river named *Uyúñgan* in Montalban, Rizal.

5. bad; a, *da-út*; b, *da-ut*; c, *da-ut-laít*.

Bkl., Bis.-L. *ráot*, n., evil; Bis.-M., Mda. *duut*, to harm; Bgb. *madút*, Bnu. *malúat*; Mnb. *madúut*; Bis.-A., Mda. *maát*; Sbn.-Dum. *ma-lat*; Dmg. *malot*; Sbl.-Bol. *marayót*; Sbl.-Ac., Ae.-SF., Ae.-Sub. *malayít*.

The third form is an interesting case of two cognate forms, probably no longer recognized as identical, being used to make an emphatic compound.

6. bamboo; a, *ka-wá-yan*; b, *ka-wá-yan*; c, *ka-wá-yan*.

Bkl., Bis., Bis.-A., Bnu., Mnb., Pamp., Tag., Sbl. *kawáian*; Ifg. *ka-wai'yan*; Bkl., Ilk., Tag. *wai*, rattan; Pamp. *dwai*, rattan.

The underlying idea in *kawáian* seems to be the same as in the Mal. name for bamboo, *rotang besar*, "big rattan." It may be though that both *wai* and *kawáian* are derived independently from a root *wai*, to sway. (Brandstetter, R. Gemeinindonesisch und Urindonesisch, p. 19.)

7. banana; a, b, *sagin*; c, —.

Bis., Bis.-M., Bnu., Bon J., Mda., Mbo., Pamp., Sbn., Tag. *ságin*.

8. bead; a1, *pan-hó-gon*; a2, *úno*; b, *sa-lá-bai*; c, *manik*.

a1: Bis., Bis.-M., Bkl., Mnb., Tag. *tóhog*, *tóhug* or *táhug*, to string, whence **pa-nohóg-on*, "objects to be strung"; Bkl. L. *totohán* (*to-tohog-án* with elision of penult and metathesis of *h* and *g*; Bkl. has no final *h*, so *totohán* would be inadmissible); Bis.-A., Bnu., Mnb. *tohogún*; Bkl. *torohogón* (*tohog* + pluralizing infix *r* and stemvowel + suffix *on*) any perforated objects that can be strung.

a2: Inb. *úno*.

b: No cognate material found.

c: Mal. *manik*; Tag. and prob. Sbl., *maniknik*, various species of *Palaquium* and other genera of *Sapotaceae*, the brilliantly polished seeds of which are used as beads.

9. bee; a, *put-yi-kan*; b, *su-kán*; c, *tabún*.

a, b: Bgb., Bis., Bis.-M., Bkl., Mnb., Mda., Pamp., Pang. *potiókan*; Sbl. *pukiítan*; Bnu. *posíkan*; Bon. C. *yukan*; Ibk. *azzíkan*; Ilk. *uyíkan*.

?c: Sbn. *te nōb*, honey, Mgd. *tanep*.

10. black; a, *ma-bi-ro*; b, *ma-túm*; c, *as-nunŷ-úno*.

a: Bgb. *bero*, soot; Bkl. L. *bíro*, soot or lamp black from smoke of pitch, used for making a kind of ink or paint; Mal., Semang. Sakai *biru*, blue.

b: Bgb., Bkl., *itóm*, black color; Bis., Bis.-M., Bnu., Mda., Mnb. *itúm*; Tag. *itím*; Sbn. *mitum*.

c: No cognate material found.

11. bolo; a, *u-ták*; b, *pi-sáu*; c, *pi-sáu*.
 a: Bis.-A., Bnu., Mnb. *uták*, broad-pointed bolo; Bkl., Tag. *iták*; Inb. *atak*; Ifg. *ó-tak*.
 b: Sbn. *pes*; Mal. *pisáu*.
12. bow; a, *bá-yi*; b, *pa-na*; c, ———.
 a: Bis., Bkl. *báhi'*, palmwood; Ilk. *bá i*; Pamp. *báyi*; Sbl. *báyi'*; Bis.-M., Enu., Mnb. *báhi'*, fishtail palm; Mda. *bá-i*, id.
 b: Bis., Bis.-M., Bkl., Bnu., Mda., Tag. *pána'*, arrow; Sbn. *pana*, bow; Ifg., Pamp. *pána*, bow and arrow; Sbl. *pána*, arrow.
13. breast (*mamma*); a, *sú-su*; b, *sú-su*; c, *ba-to*.
 a, b: Ban., Bis., Bis.-M., Bkl., Bnu., Bon. J., Ilk., Inb., Knk., Lep., Mda., Mgd., Mnb., Pamp., Sbl., Tag. *sóso*, (*súsu*), *sóso'*.
 c: No cognate material found.
14. calf of leg; a1, *ka-pus-gán*; a2, *orudan*; b, *bör-rös*; c, *tiñg-tiñg*.
 ? a1: Bon. C., *fitkin*.
 a2: No cognate material found.
 b: No cognate material found, unless *börrös* be a variant of *bitis* (see under foot), which seems scarcely probable.
 c: Btn. *altenñ*, leg; Form. *tintin*, *tiñgtiñg*, foot; Pamp. *tintinbutit*.
15. carabao; a, *karabáu*; b, *a-nuañg*; c, *a-nuañg*.
 a: Bnu., Mda., Tag. *kalabáu*; Bis. *karabáu*; Bis.-A. *kábau*; Mnb. *kiábau*.
 b, c: Bon. C., Ibk., Ilk. *nuáñg*; Bon. J. *noáñg*; Ifg. *ndañg*; Bkl. L. (now apparently obsolete) *anuáñg*.
16. carry; a, ———; b, *mag-ba-bá*; c, ———.
 Bis.-M., Bkl., Bnu., Mda., Mnb., Pamp., Tag. *babá* or *báha*, to carry on the back.
17. cat; a, *ku-tí*; b, *mú-niñg*; c, *pú-sa*.
 a: Bis., Pamp., Sbn.-Dum. *kutíñg*; Bkl., Sbl., Tag. *kutíñg*, kitten; Inb. *kúting nan púsa*, kitten; Ibk. *kitáu*; Ibk. (Pamplona) *kusá*; Bis.-M., Mda. *kudíñg*; Bkl. *ikús*, vocative *kus*.
 b: No closely cognate form found, but it seems not improbable that *múniñg* is a variant of some form of the widely distributed IN root from which both a and c are derived.
 c: Ilk., Pamp. *púsa*; Sbl., Tag. *púsa'*; Ifg. *púha*.
 (Ifg. regularly has *h* for gen. Phil. *s*.)
18. chest; a, *dub-dúb*; b, *so-ót*; c, *ta-lam-bañg án*.
 a: Ae.-Bat., Ae.-Sub. *dubdub*; Bis.-M., Mda. *dubdub*, stomach; Sbn. *gögdöb le-e*, breast of man, *dub-dub li-bun*, of woman; Sub.-NR. *e-döb*, breast; Sub.-Dum. *göddöb*; Tag. *dibdib*; Dmg. *dibdib*; Ifg. *dibdib*, wind.
 b: Perh. Inb. *sosot*, intestines.
 c: No cognate material found, unless: Bkl. L. *lambónñg* or *yambónñg*, tunic; the *o* being unaccented might be assimilated to the preceding and following *a*'s; other instances of parts of the body named after things worn on them are: Bkl. *bahág*, loin-cloth, *pagbahágan*, waist; Bkl. L. *botók*, bracelet, *bobotkán*, wrist; Bkl. *hikau*, earring, *hikauán*, earlobe.

"The current Spanish name, adopted by all other foreigners, for "bush knife," "machete"; no dictionary I have seen gives any explanation of it. Perhaps it is a Spanish corruption of Tag. and Bkl. *gólók* or *gúluk*, the ordinary working bolo.

19. child; a, *a-nák*; b, *uñg-á*; c, *uñg-á*.
 a: Bis., Bis.-M., Bnu., Bon. C., Ilk., Mda., Mnb., Pamp., Sbl., Tag. *anák*, son, daughter; Ifg. *nak*, id.; Ibkl. *aná*, id.; Bkl. L. *anak*, unborn young of carabao.
 b, c: Bon. C. *oñgōñga*, children; Bon. J. *oñgōñga*, child; Ifg. *ōñga*, child, *oñgōñga*, children.
20. coat; a, *ba-bu-kás*; b, ———; c, ———.
 Igt. of Balangao (Jenks, p. 155) *balúkas*, breech cloth; Inb. *bal-kes*, belt; Ilk. *barikes*, belt. (See also material under pocket belt.)
21. coconut; a, *ni-úg*; b, *ni-úg*; c, *ni-úg*.
 Bis.-M., Bkl., Ilk., Mda., Mnb., Sbl., Sbu., Tag. *nióg* or *niúg*; Ifg. *núg*; Sub.-Ifg. *kyug*; Ibkl. *niúk*, Bnu. *nidiug*.
22. cold; a, *ma-ra-mig*; b, *ma-dim la-a-ni*; c, *ma-lamig*.
 a, c: Bis., Klm., Tag. *malamig*, Ilk. *nalam'ík*, *lammin*; Ibkl. *lummin*.
 b: Pamp. *dímla*, n., *marímla*, adj., cold.
 The second form is probably from the same grundwort as the other two; one of the peculiarities of Pamp. is the frequent occurrence of metathetic forms.
 Judging from the ending *-ani* (see remark under afternoon) *madimlaní* perhaps means not "cold," but "cold season" or "the coolest hour (of the night)."
23. cook, to; a, ———; b, *manñ-apui*; c, ———.
 Ibkl. *magafui*, to cook rice; Ilk. *agapui*, id. (See fire.)
24. cotton; a, *bú-rak*; b, *si-nu-lid*; c, ———.
 a: Bis., Pamp., Tag. *búlak*
 b: Pamp. *súlud*, thread, *sinúlud*, cotton thread; Tag. *sulid*, to twist, *sinulid*, cotton thread; Ifg. *hinulit*, fine thread.
 It is probable that there was between the Mangyan and the interpreter a confusion of the article "thread" with the material "cotton," as it seems scarcely probable that the word for "cotton" should not exist in any given Phil. language or dialect.
25. day; a, *si-ráñg*; b, *aldáu*; c, *a-rau*.
 a: Bkl. *siránñg*, to shine, to rise, *siránñgan*, east, orient; Tag. *silang*, *silánñgan*, id.; Pamp. *aslag*, to shine, *sinlay*, shone. (See also to-day.)
 b, c: Bkl., Ilk., Pamp. *aldáu*; Bis., *adláu*; Bis.-M. *ádlau*; Bnu. *ádau*; Mnb. *ádau* (Germ. *ä*); Mda. *állau*; Ibkl. *ággau*; Ifg. *álgo*; Sbl. *áulo*; Tag. *árau*.
26. dog; a, *ido*; b, *idú*; c, *kitó*.
 Bis.-M., Bis., Mda. *ido*; Bis. *iro*; Bkl. *ido*, puppy; Tir. *itú*; Btn. *chito*; Ibkl. *ito*, *kito*; Klm. *kito*; Sbn. *gitu*.
27. down; a, *a-ba-bá*; b, *sañg-a-tó*; c, *ta-tú*.
 a: Bis., Bkl., Ilk., Pamp., Tag. *babá* or *babú*, down, go down, descend, put down, lower; Bnu., Mnb. *dibába*, to go downstream; Mda. *bába*, id.
 b, c: No cognate material found.
28. ear; a, *tu-lí*; b, *ta-liñg-á*; c, *ta-liñg-a*.
 a: Bkl., Ilk. *tulí*, earwax; Bgh. *túli*, id.; Tag. *tutuli*, id.; Bis. *atutuli*, id.; Sbl.-Bol. *totoryán*; Sbl.-Iba *totolyán*; Sbl.-Ae., Ae.-SF. *túli*; Bis.-M., Bnu., Mda., Mnb., *atili*.

- b, c: Bgb., Bis., Bkl., Dmg., Ibk., Sbn., *taliñja*; Bis.-M., Bgb., Ilk., Mda., Mnb. *taliñja*, lug, handle (*taliñja* has this as a secondary meaning in many other languages); Tag. *taliña*.
29. elbow; a, *sé-ko*; b, *si-ko*; c, *st-ko*.
Bgb., Bis., Bis.-M., Bkl., Bnu., Bon., Ibk., Ilk., Lep., Mda., Mnb., Pamp., Pang., Tag. *siko* or *siko'*; Ifg. *hiku*; Sbl. *hiko*.
30. eye; a, *matá*; b, *ma tá*; c, *matá*.
Ae., Ban., Bgb., Bis., Bis.-M., Bnu., Bon. S. J. C., Gin. S., Ibk., Ifg., Ilk., Inb., Klm., Knk., Lep., Mda., Mgd., Mnb., Pamp., Pang., Sbl., Sul., Tag. *mata* or *mata'* (with variable accent); Gin. M., Ting. *ada*; Tir. *moto*.
31. eyebrows; a, *kid-són*; b, *ba-lis-kög*; c, *idúp*.
a: Bkl., Ibk., *kirai*; Bon. J. *kichí*; Bon. C. *kichoí*; Bis., Tag. *kilai*; Ifg. *kidi*; Sub-Ifg. *ichóm*; Smb. *kiloi*; Bis.-M., Bnu., Mda. *kilái*; Mnb. *kilúi*.
b: Bkl. L. *bulakóg*, staring eyes; Bkl. L. *alisákog*, eyes blazing with anger.
c: Pamp. *trap*, eyelashes; Bkl. L. *kirapkirap*, to wink rapidly or frequently.
32. eyelashes; a, *ami-me-rúk*; b, *ki-rai*; c, *bul-bul*.
a: Bis. L. *amihúlik*; Bkl., Sbl. *pirók*; Tag. *pilik-matá*.
b: See eyebrows.
c: Bkl., Tag. *bulbúl*, pubic hair; Bis. *bulbúl*, down, hair of the body; Tag. *bólo*, down of fruits; Pamp. *bulbúl*, pubescence, feather; Bis.-M. *búibúi*, pubic and axillary hair; Bgb., Bnu. *bulbúl*, hair; Mda. *búibúi*, id.; Mnb. *bobü* (Germ. *ü*), id.
33. fall, to; a, ———; b, *na-la-bo*; c, ———.
Pamp. *nábo'*, to throw down, overthrow; Sbl. *nábo'*; Bgb. *gobbá*; Bkl. *gabá'*; Ibk. *giván*; Ilk. *rebbá*, *gibáen*; Tag. *gibá'*; Tir. *gabá*, *rebá*; Bis.-M., Bnu., Mda., Mnb. *gúba*, to destroy, to go to ruin.
34. finger, toe; a, *itu-to-ró*; b, *só-lo*; c, *su-lú*.
Bgb. *tintudo*; Bis. *tudló'*; Bis.-M., Bnu., Mnb., *túdló*; Bkl. *moró'*; Bkl. L. *soló*, hoofs of cattle, sheep, etc.; Ilk. *tamudú*, index f.; Klm. *toldo*; Mda. *túllo*; Mgd. *tinduru*; Pamp. *turú*; Pang. *tamoró*; Sbn. *tunduh*, finger, index f.; Sbl. *tamoró'*, index f.; Tag. *hin-tutáro'*, id.
- All of these forms are from a widely distributed grundwort *tudu=turu* which means primarily "to point," then "direct," "teach," "show," "instruct"; (See index finger.) For the change of initial *t* to *s* in *b* and *c*, compare Mgy. *sukán*, Ibk. *azzúkan* and Bnu. *posíkan* under *bee*.
35. thumb; a, *i-na-i-ná*; b, *pa-na-köl*; c, ———.
a: Bgb. *ina-iná*, godmother; Ban., Bkl., Bon. S. J. C., Btn., Gin. S., Ibk., Ilk., Inb., Klm., Knk., Lep., Mgd., Pang., Sul., Tag. *iná*, mother; hence (?) *inaíná*, the "little mother" of the fingers; or (?) from Bkl. *ina'*, to diminish, the "diminished finger", as having one joint less than the others.
b: See large. Other names for thumb meaning "big finger" are: Bis. *kumalágko*; Bkl. *tindarákol*; Pamp. *tindaragul*.

36. index finger; a, *tu-tú-yau*; b, *pan-áó*; c, ———.
 a: Bis. *tóro'*; Bkl. *toldó'*; Pamp. *táru*; Tag. *hintutúro'*; Ifg. *ámtádu*;
 and other forms given under finger.
 b: Probably * *panudú* from grundwort *tudu*.
37. middle finger; a, *ma-na-lá-bau*; b, *lábis na solo*; c, ———.
 a: Bis.-M., Bkl. *panlábau* < *lábau*, projecting, salient, exceeding,
 standing out (see *sakbáu* under mountain); Bnu. *ilalabáu*;
 Mda. *pangukábau*.
 b: Bis., Tag. *lábis*, excess; Bkl. *labí*, id.
38. ring finger; a, *pa-úñg*; b, ———; c, ———.
 ? Bis. *paniñgsiñgan*, Pamp. *palsiñgsiñgan*; Bis., Bkl., Pamp., Tag.
siñgsiñg, ring.
39. little finger; a, *lanḡ-gi-gis*; b, *pa-na-gis*; c, ———.
 Bis. *kamaliñgkiñg*; Bkl. *gigis*; Bon. C. *ikikiñg*; Iok. *amikuk'*; Ilk.
kikít; Pamp., Tag. *kaliñgkiñgan*; Sbl. *tanḡginih*; ¹² Bis.-M.,
 Bnu., Mda., Mnb. *kiñgkiñg*.
40. fire; a, *apúí*; b, *apui*; c, *ba-ya*.
 a, b: Ae., Ban., Bgb., Bon. S. J. C., Gin. M. S., Ifg., Ilk., Inb., Klm.,
 Knk., Lep., Mgd., Pang., Tag., Tiñḡ. *apoi* or *apui* (with varied
 accent); Pamp. *apí*; Ibk. *afuí*.
 c: Bis., Bis.-M., Bgb. G., Bkl., Bnu., Mda., Mnb., Sbn., Tag. *bága*,
 ember, glowing coal; Pamp. *báya*, id.
41. foot; a, *rap-ráp-pa*; b, *pá-a*; c, *da-la-pa*.
 a, c: Ban., Bkl., Ifg., Ilk., Lep. *dapán* or *dápan*, sole; Bis.-I. *dapa-*
dapá, id.; Bis.-L. *rapadapá*, id.; Ibk. *dápanḡ*, id.; Grn. S. *zapan*;
 Bon. S. C., Inb. *chapán*; Tiñḡ. *dabán*; Form. *dapaí* and *rapaí*;
 Sbl. *palapá*, sole.
 b: Bgb., Sbn. *páa*; Tag. *paá*; Ae. and Sbl. (six dialects), Bis.-M.,
 Bkl., Bnu., Mda., Mnb. *páa*, thigh.
42. gabi;¹³ a, *gabi*; b, *gabi*; c, *bu-tig*.
 a, b: Tag. *gábi*; Ifg. *ába*, *kába*; Ilk. *ába*; Bis. *gabi*; Ibk. *gábi'*;
 Bkl. *gábi*, *Alocasia* sp.
 c: Metathetic form of Ibk. *gabi'*? Bkl., beside *gábi*, has *bíga*,
 another species (or mere variety?) of the same genus; Lisboa
 gives *póka*=Tag. *makópa*, (*Eugenia javanica* Lam.).
43. good; a1, *ma-yad*; a2, *ma-hál*; b, *pi-á*; c1, *kap-yan*; c2, *a-tug*.
 ? a1: Bis.-I. *maáyo*; Bis.-M. *madayáu*, *marajáu*; Bnu. *madadiáu*; Mda.
madayáu, *madaduáu*; Mnb. *madadáu*; Ifg. *maphód*.
 a2: Bkl., Tag. *mahál*, dear, precious.

¹² The final *h* in this word, it may not be superfluous to remark, does not stand for the glottal check, which throughout this paper is represented by ('); except in the region immediately about Sta. Cruz, Zambales, general Philippine *s* is weakened in Sbl. to *h*, somewhat less aspirated than *ch* in Germ. *loch* and *ich*.

¹³ The Tag. name of the taro or poi-plant (*Colocasia antiquorum* Schott). It is applied, in Bkl. certainly and probably also in other languages, to other plants of the same family.

b1, c1: Bis. L. *maópai*; Ib. *naíá*; Sub.-NR. *piá*; Pamp. *máyap*, *áyap*, *káyap*, goodness, *áppia*, *kápia*, nobility, wealth; *makáppia*, *áyap*, *káyap*, goodness, *áppia*, *kápia*, nobility, wealth; *makáppia*, good; Wallace, Malay Arch., p. 478: *piá*, *marape*, *mapia*, *mapyia*.

c2: No cognate material found.

44. hair; a, *bu-kúk*; b, *o-bók*; c, *a-bók*.

Bis., Bkl., Tag. *bóhok*; Ae.-Bat. *labúk*; Ib. *vu^u*; Ifg. *búuh*; Ilk. *boók*.

45. hand; a, *kámanǵ*; b, *a-lí-ma*; c, *bak-wán*.

a: Bis., Bkl. *kamót*; Mda. *kamút*; Bkl. *kámot* to scratch; Tag. *kamít*, id; Tag. *kamái*; Ib. *kámanǵ*; Bkl. L. *kamanǵkamanǵ*, to wave or flourish the arms; Mda. *kámanǵ*, to get with the hand.

b: Bgb., Bon. S. J. C., Ib., Ilk., Mgd., Pang. *líma* or *liná*; Ilk. *íma*; Inb. *díma*; Sul. *límah*; Bis.-M., Bnu. *alíma*; gen. Phil. *líma* five.

c: No cognate material found.

46. he; a, *si-á*; b, *si-á*; c, ———.

Bis., Bis.-M., Bkl., Bon. C., Mda., Tag. *siá*; Ifg. *hía*; Sbl. *hiá*; Ib. *yáya*.

47. head; a, *ú-lo*; b, *ó-lo*; c, *ú-lu*.

Ae.-Bat., Ae. and Sbl. (5 dialects), Bgb., Bis., Bnu., Bon. S. J. C., Gin. M. S., Ib., Ifg., Ilk. Lep., Mgd., Mnb., Pang., *ó-lo*, or *ú-lu*; Klm. *kolo*; Tir. *ulu*; Bis.-A., Bkl. L., Mda. *óo*.

48. here; a, *st-tai*; b, *pa-ra-ói*; c, *in-dá*.

a: Ifg. *hitú* (Ifg. *h*=gen. Phil. *s*); Ilk. *ditói*; Sbl. *itt*; Tag. *dito*.

? b: Inb. *chiai* (Inb. *ch*=gen. Phil. *d*; *paraói* may be *pa-daói*).

? c: Bon. C. *isna*.

The relations between the equivalents of "here," "there," and "yonder" in the various Philippine languages are very obscure and complex; only where the resemblance between two forms is extremely close, or where such differences as may exist are clearly explained by parallels in the same languages, is it safe to assume that two such forms are closely cognate.

49. honey; a, *dai-kút*; b, *dö-gös*; c, *de-kút*.

a, c: Bis., Bkl. *dokót*, to stick; Ifg. *dayákót*, *dumíkót*, sticky; Tag. *dikít*, to stick, *malagkit*, sticky; Bon. C. *enlanǵkot*, sticky; Inb. *dinǵket*, honey; Bon. C. *nikót*, pitch; Ilk. *napigkit*, sticky; Ib. *narakkót*, id; Bkl. *maragkót*, rough (i. e., apparently sticky on account of not being smooth, like sand paper).

b: Bis.-L.-I. *dugús*; Bgb., Bnu., Mda., Mnb. *dúga*.

50. hot; a, *ma-i-nit*; b, *ma-i-búnǵ*; c, *ka-i-búnǵ*.

a: Bgb., Bis., Bkl., Tag. *ínit*, heat; Bon. C. *ínitok*, to heat; Ifg. *ínitom*, id.; Sbn.-NR. *nínit*; Sbn.-Dum. *mayanit*. (See also *sun*.)

b: Bkl. *imbúnǵ*, warmth, to warm. (See also *afternoon*.)

51. house; a, *ba-lai*; b, *ba-lai*; c, *ba-lai*.

Bis., Ib., Ilk., Klm., Lep. *bálai* or *balái*; Tag. *báhai*; Inb. *bálei*; Pamp. *bále*, *bálai*; Ifg. *bále*; Sbl. *balí*; Sbn.-NR. *baley*; Btu. *vahai*; Bkl. *baláian*, watchman's hut in field; Pang. *bálei*, village.

52. 1; a, *a-kó*; b, *a-kó*; c, *ba-ging-yák*.
 a, b: Bis., Bis.-M., Bkl., Btn., Mda., Tag. *akó*; Pamp. *akú*; Bon. C. *sakon*; Ilk. *siák*; Inb. *sikak*; Sbl. *siko*.
 c: Ilk. *bagé*, human body. Hence *bagiñy-yák*, "body mine"?. But see also *kabutyak* under *thou*.
53. *kaiñgin*;¹¹ a, *tan-nán*; b, *a-ga-yím*; c, *ga-más*.
 a: Bis., Bkl. *tanóm*, plant, to plant; Ifg. *tánun*, to plant; Bis.-M., Bnu., Mda., Mnb. *tanúm*, id.; Tag. *taním*, id.; Pamp. *tánam*, to plant rice; Bon. C. *taním*, plant, *maitamnan*, planting; Bkl. *tatamnán*, garden, plantation; Bis. *tanáman*, garden.
 b: No cognate material found.
 c: Bis.-M., *gas*, to clear land; Bnu., Mda., Mnb. *gayas*; id.; Bkl. L. *ganás*, *nasnás*, to clear a space for the purpose of felling bamboos or trees.
54. *knee*; a, *tu-ai-tú-ai*; b1, *dúlañg*; b2, *to-ol*; c, *ntul*.
 a, b2, c: Bis.-M., Mda. *túai-túai*, kneecap; Ib. *túad*; Bis., Bkl. Tag. *tóhod* or *túhud*; Bis.-M. *tóhud*; Sbn. *takh-tuai*; Sbn.-Dum. *dulud*; Pamp. *tud*; Ifg. *túng*; Sbl. *toór*; Klm. *tood*; Tir. *etur*; Mda. *tóud*, kneecap; Bis.-I., Bis.-L., Bkl., Tag. *lohód* or *luhúd*, to kneel.
 b1: Ib. *dulúñg*.
55. *large*; a, *dakú*; b, *la-kol-náu*; c, *tuñy-yán*.
 a, b: Bgb. *dakól*; Bis. *dakó*; Bis.-A. *dakúa*; Bis.-M. *matagkú*; Bkl., Ifg. *dakól*, much, many; Bkl. *dakóla'*; Bnu. *dagdági*; Ib. *dakál*; Ilk. *dakkél*; Mnb. *dáki*; Pamp. *dakál*, much, *dagúl*, largeness; Sbl. *lakó*, much; Sul. *dakolah*; Tag. *dakila'*, great, grand; Bkl., Tag. *dagdag*, to increase, augment, add to.
 ? c: Mal. *tiñgi*, height; Dmg. *húñga*, large.
56. *left (side)*; a, *walá*; b, *ka li-wá*; c, *tag-wa-lá*.
 Bis., Bkl., Tag. *walá*; Tag. *kahwá*; Bis.-M., Mda. *kawá*; Bnu. *kawalá*; Mnb. *kawá*.
57. *leg*; a, *ba-láñy-bañg*; b, *pa-nó-bo*; c, *bi-tis*.
 a, b: No cognate material found
 c: Bis.-M., Bnu., Mda., Mnb. *bitis*, calf; Bkl., Pamp. *bitis*, foot; Sbl. *bitih*, lower leg; Tag. *bintó'*, calf; Sbn. N. R. *botis*, foot.
58. *loin cloth*; a, *ba-ág*; b, *ba-ái*; c, *a-bái*.
 Bis., Bkl., Mnb., Tag. *bahág*; Ib. *vag*; Ilk., Mda. *baág*; Bkl. *habái*, waist band (of skirt or trousers); Bkl. L. *sabúit*, sash with purse at end for carrying gold-weights or other articles; Sbl. *lobái*; Mda. *ábai*, belt (usually beaded); Mnb. *hábai*, id.
59. *loom*; a, *hab-hín*; b, *bu-la-bu-la*; c, ———.
 Bis.-L., Bis.-M., Bkl. *hábol*, web, cloth, to weave, Bis.-L. *halablan*; Bis.-M. *hablón*; Bkl. *habólón*; Mda. *ábol*, *ábui* > *ablón*; Mnb. *hábai* > *habión*; Ifg. *ábol*, to weave; Ilk. *pañgabián*; Sbl. *pañgabolán*; Tag. *hábit*, to weave; Tag. *hablón*.
60. *long*; a, *á-ba*; b, *ma-á ba*; c, *ka-báñg*.
 Bis., Bkl. *lába'*, length, *halába'*, long; Tag. *hába'*, *mahába'*, id.; Bis.-M., Mnb. *mahába*; Mda. *maúba*; Pamp. *makába*; Sbn.-NR. *muyaba*; Sbl.-Iba. *mahibán*; Bkl. L. *yabáñg*, broad, spacious.

"Tag, "a cultivated clearing," a term widely known and used in the Islands.

61. man; a, *la-lá-ki*; b, *la-la-ki*; c, *la kí*.
 Bis., Bis.-M., Bkl., Bon. J. C., Gin. M. S., Ibk., Ifg. Ilk., Knk., Lep.,
 Pamp., Sbl., Tag., *Tiñg.*, *laláki*; Bon. S., Pang. *lákí*; Inb. *daxi*.
62. milk; a, *gá-tas*; b, *yá-tas*; c, *gá-tas*.
 Bis., Bis.-M., Bkl., Bnu., Ilk., Mfa., Mnb., Pamp., Sbn., Tag. *gátas*;
 Bon. C., Inb. *kátas*; Ibk. *gattó'*.
63. monkey; a, *a-mó*; b, *amó*; c, *ba-kús*.
 a, b: Bis., Bis.-M., Bkl., Bnu., Mda., Mnb. *amó'*; Sul. *amok*.
 c: Inb. *baxes*; Pamp. *bagis*, a monkey larger than a *bakulan*; Sbl. *bakó'*; Mnb. *bakás*, a species of snake.
64. moon; a, *bú-lan*; b, *bu-lá-nun*; c, *bú-lan*.
 Ban., Bgb., Bis., Bkl., Gin. S., Ifg., Ilk., Inb., Klm., Pamp., Pang.,
 Sbn., Sbl.-Iba *búlan*; Sbl.-Bol. *búran*; Sbl.-Ae., Ae.-S. F. *búan*;
 Tag. *buán*; Ae.-Sub. *búyan*; Bkl. *búlánon*, adj., moonlit, moonlight.
65. mountain; a, *ban-túd*; b, *ól-nan*; c, *sak-báu*.
 a: Bkl. *bantúd*, elevation, mound; Bkl. L. *bantód*, *pantúd*, id.; Inb. *chuntuk*; Ilk. *bantái*; Mnb. *úntud*; Pamp. *binduk*; Tag. *búnduk*.
 b: Pamp. *ólo*, headwaters; Tag. *úlo*, id. (see also head); Bis., Bkl. *ulúnan* or *ulnán*, pillow (i. e. head-place); Bis.-M., Mda. *úlan*, id.; Mda. *únan*, id.; Mnb. *úan*, id.; Pamp. *ulúnan*, id.; Tag. *únan*, id.
 c: Bkl. *umbáu* (*unybáo*, Lisboa) head (on a measure of grain, etc.); *lábau*, projecting, salient, standing out or above; and the foll., all from Lisboa: *mábau*, to weave in the manner of corduroy; *takóbau*, to be high or tall, e. g. the load in a boat, the grass on the edge of a field; *taríbau* and *tíbau*, id. (See also middle finger.)
66. mouth; a, *bi-bíg*; b, *bí-bí*; c, *bí-bí*.
 Bgb., Tag. *bibig*; Ibk. *viuk*, lips; Ilk., Sbn.-Dum., Pan. *bibíg*, id.; Pang., Klm., Mgd. *bibil*, id.; Sbl. *bobói*.
67. neck; a, *li-úg*; b, *lo-ói*; c, *ta-láu*.
 a, b: Bis., Bis.-M., Bkl., Mda., Mnb., *liog* or *liug*; Tag. *liig*; Sbl. *lóoi*; Ibk., Mgd. *lig*; Sbn. *lehg*.
 c: Bkl. L. *tilau*, uvula; Bkl. *bakláu*, plaited rattan ferule on the "neck" of spear shafts, tool handles, etc.; Bkl. *bukláu*, goitre; Btn. *lagao*; Ibk. *bulláu*, throat; Ilk. *bukláu*, glutton; Inb. *bukdou*; Pang. *bekléo*; Sbl. *bukláu*, throat.
68. night; a, *ya-bí*; b, *mad-lúm*; c, *ya-bí*.
 a, c: Bis., Tag. *gabí*; Bis.-M. *gabíi*; Ifg. *lábí*, dark; Ibk. *gaví*; Ilk. *rabii*; Gin. S. *labíi*; Lep., Knk., Pang., *Tiñg.* *labí*; Mda. *gábí*, *gabíla*; Sbl. *yabí*.
 b: Bis., Bkl. *dulúm*, darkness; Bis.-A. *dum*, night, *madiggun*, dark; Bon. C. *maschöm*; Gin. S. *madschum*; Ifg. *madlúm*; Mnb. *madiggun*, dark, *madokilum*, night. (See also *madlumani* under sunset.¹⁴)

¹⁴ For a discussion of this root, see Scheerer, Batan Dialect, WL 7 and 7a, and pp. 102-3.

52. 1; a, *a-kó*; b, *a kó*; c, *ba-ging-yák*.
 a, b: Bis., Bis.-M., Bkl., Btn., Mda., Tag. *akó*; Pamp. *akú*; Bon. C. *saken*; Ilk. *siák*; Inb. *sikak*; Sbl. *siko*.
 c: Ilk. *bagi*, human body. Hence *bagiñy-yák*, "body mine"?. But see also *kabutyak* under thou.
53. *kaiñgin*;¹ a, *tan-mán*; b, *a-ga-yim*; c, *ga-más*.
 a: Bis., Bkl. *tanóm*, plant, to plant; Ifg. *tánam*, to plant; Bis.-M., Bnu., Mda., Mnb. *tanúm*, id.; Tag. *taním*, id.; Pamp. *tánam*, to plant rice; Bon. C. *tanim*, plant, *mailamuan*, planting; Bkl. *tatamán*, garden, plantation; Bis. *tanáman*, garden.
 b: No cognate material found.
 c: Bis.-M., *gas*, to clear land; Bnu., Mda., Mnb. *gayas*; id.; Bkl. L. *ganás*, *nasnás*, to clear a space for the purpose of felling bamboos or trees.
54. knee; a, *tu-ai-tú-ai*; b1, *dúlañg*; b2, *to-ol*; c, *utul*.
 a, b2, c: Bis.-M., Mda. *túai-túai*, kneecap; Ib. *túad*; Bis., Bkl. Tag. *tóhod* or *túhud*; Bis.-M. *tóhud*; Sbn. *takh-tuai*; Sbn.-Dum. *dulud*; Pamp. *tud*; Ifg. *túug*; Sbl. *toór*; Klm. *tood*; Tir. *ctur*; Mda. *tóud*, kneecap; Bis.-I., Bis.-L., Bkl., Tag. *lohód* or *luhúd*, to kneel.
 b1: Ib. *dulúñg*.
55. large; a, *daká*; b, *la-kol-náu*; c, *tuñy-yán*.
 a, b: Bgb. *dakól*; Bis. *dakó*; Bis. A. *dakúa*; Bis.-M. *malagká*; Bkl., Ifg. *dakól*, much, many; Bkl. *dakóla*; Bnu. *daguági*; Ib. *dakál*; Ilk. *dakicél*; Mnb. *dákí*; Pamp. *dakál*, much, *dogál*, largeness; Sbl. *lakó*, much; Sul. *dakolah*; Tag. *dakila*, great, grand; Bkl., Tag. *dagdag*, to increase, augment, add to.
 ? c: Mal. *túnggi*, height; Dmg. *húñga*, large.
56. left (side); a, *walá*; b, *ka-li-wá*; c, *tag-wa-lá*.
 Bis., Bkl., Tag. *walá*; Tag. *kaliwá*; Bis.-M., Mda. *kawá*; Bnu. *kawalá*; Mnb. *kawá*.
57. leg; a, *ba-lañg-bañg*; b, *pa-nó-bo*; c, *bi-tis*.
 a, b: No cognate material found.
 c: Bis.-M., Bnu., Mda., Mnb. *bitis*, calf; Bkl., Pamp. *bitis*, foot; Sbl. *bitih*, lower leg; Tag. *binté*, calf; Sbn. N. R. *botis*, foot.
58. loIn cloth; a, *ba-ág*; b, *ba-ái*; c, *a-bái*.
 Bis., Bkl., Mnb., Tag. *bahág*; Ib. *vag*; Ilk., Mda. *baág*; Bkl. *habái*, waist band (of skirt or trousers); Bkl. L. *sabái*, sash with purse at end for carrying gold-weights or other articles; Sbl. *lobái*; Mda. *ábai*, belt (usually beaded); Mnb. *hábai*, id.
59. loom; a, *hab-lún*; b, *lu-la-bu-la*; c, ———.
 Bis.-L., Bis.-M., Bkl. *hábol*, web, cloth, to weave, Bis.-L. *halablá-nan*; Bis.-M. *hablón*; Bkl. *habólún*; Mda. *ábol*, *ábui* > *ablón*; Mnb. *hábuí* > *habión*; Ifg. *ábol*, to weave; Ilk. *pañyablán*; Sbl. *pañyabolán*; Tag. *hábit*, to weave; Tag. *hablón*.
60. long; a, *á-ba*; b, *ma-á-ba*; c, *ka-bañg*.
 Bis., Bkl. *lába*, length, *halába*, long; Tag. *hába*, *mahába*, id.; Bis.-M., Mnb. *mahála*; Mda. *maába*; Pamp. *makába*; Sbn.-NR. *mayaba*; Sbl.-Ibn. *mahibán*; Bkl. L. *yabáñg*, broad, spacious.

¹ Tag. "a cultivated clearing," a term widely known and used in the Islands.

61. man; a, *la-lá-ki*; b, *la-la-ki*; c, *la-ki*.
 Bis., Bis.-M., Bkl., Bon. J. C., Gin. M. S., Ibk., Ifg. Ilk., Knk., Lep.,
 Pamp., Sbl., Tag., Tñg., *laláki*; Bon. S., Pang. *lákí*; Inb. *daxi*.
62. milk; a, *gá-tas*; b, *yá-tas*; c, *gá-tas*.
 Bis., Bis.-M., Bkl., Bnu., Ilk., Mfa., Mnb., Pamp., Sbn., Tag. *gátas*;
 Bon. C., Inb. *kátas*; Ibk. *gattó'*.
63. monkey; a, *a-mó*; b, *amó*; c, *ba-kús*.
 a, b: Bis., Bis.-M., Bkl., Bnu., Mda., Mnb. *amó'*; Sul. *amok*.
 c: Inb. *baxes*; Pamp. *bagis*, a monkey larger than a *bakulau*; Sbl.
bakó'; Mnb. *bakús*, a species of snake.
64. moon; a, *bú-lan*; b, *bu-lú-nun*; c, *bú-lan*.
 Ban., Bgb., Bis., Bkl., Gin. S., Ifg., Ilk., Inb., Klm., Pamp., Pang.,
 Sbn., Sbl.-Iba *búlan*; Sbl.-Bol. *búran*; Sbl.-Ae., Ae.-S. F. *búan*;
 Tag. *buán*; Ae.-Sub. *báyan*; Bkl. *bulánon*, adj. moonlit, moon-
 light.
65. mountain; a, *ban-túd*; b, *ól nan*; c, *sak-báu*.
 a: Bkl. *bantúd*, elevation, mound; Bkl. L. *bantód*, *pantúd*, id.; Inb.
chuntuk; Ilk. *bantái*; Mnb. *intud*; Pamp. *bnduk*; Tag. *bún-
 duk*.
 b: Pamp. *ólo*, headwaters; Tag. *álo*, id. (see also head); Bis., Bkl.
ulúnan or *ulnán*, pillow (i. e. head-place); Bis.-M., Mda.
úntan, id.; Mda. *únan*, id.; Mnb. *úan*, id.; Pamp. *ulúnan*, id.;
 Tag. *únan*, id.
 c: Bkl. *umbau* (*uñgbáo*, Lisboa) head (on a measure of grain, etc.);
lábau, projecting, salient, standing out or above; and the foll.,
 all from Lisboa: *mábau*, to weave in the manner of corduroy;
takóbau, to be high or tall, e. g. the load in a boat, the grass
 on the edge of a field; *tarlbau* and *tíbau*, id. (See also middle
 finger.)
66. mouth; a, *bi-bíg*; b, *bí-bí*; c, *bí-bí*.
 Bgb., Tag. *bibig*; Ibk. *vivik*, lips; Ilk., Sbn.-Dum., Pan. *bibig*, id.;
 Pang., Klm., Mgd. *bíbil*, id.; Sbl. *bóbóí*.
67. neck; a, *li-úg*; b, *lo-ói*; c, *ta-láu*.
 a, b: Bis., Bis.-M., Bkl., Mda., Mnb., *hog* or *ling*; Tag. *liig*; Sbl.
lói; Ibk., Mgd. *lig*; Sbn. *lehg*.
 c: Bkl. L. *tilau*, uvula; Bkl. *bakláu*, plaited rattan ferule on the
 "neck" of spear shafts, tool handles, etc.; Bkl. *bukláu*, goitre;
 Btn. *lagao*; Ibk. *bulláu*, throat; Ilk. *bukláu*, glutton; Inb.
bukdou; Pang. *bekléo*; Sbl. *bukláu*, throat.
68. night; a, *ya-bí*; b, *mad-lúm*; c, *ya-bí*.
 a, c: Bis., Tag. *gab'i*; Bis.-M. *gabú*; Ifg. *lábí*, dark; Ibk. *gavi*;
 Ilk. *rabii*; Gin. S. *labii*; Lep., Knk., Pang., Tñg. *labi*; Mda.
gábi, *gabíla*; Sbl. *yabi*.
 b: Bis., Bkl. *dulúm*, darkness; Bis.-A. *dum*, night, *madiggum*, dark;
 Bon. C. *maschom*; Gin. S. *madschum*; Ifg. *mátdum*; Mnb.
madiggium, dark, *madokílum*, night. (See also *madlumani*
 under sunset.²⁵)

²⁵ For a discussion of this root, see Scheerer, *Batan Dialect*, WL 7 and 7a, and pp. 102-3.

69. nose; a, *irúnŋ*; b, *o-rónŋ*; c, *ñgú-luŋŋ*.

Bis., Bis.-M., Mda., Tag. *ilónŋ* or *ilúnŋ*; Bon. C. *örónŋ*; Bon. J. *ilúnŋ*; Ifg. *ólonŋ*; Ib. *igónŋ*; Ilk. *agónŋ*; Pamp. *áruŋŋ*; Sbl.-Ae., Ae.-S. F, Ae.-Sub. *balónŋo*; Bkl. *doŋŋó*; Sbn. *sooŋŋ*; Mgd. *ñirunŋ*.

70. palm (of the hand); a, *da-lú-kap*; b, *pá-lad*; c, *da-lu-káp*.

a, c: Ilk. *dakúlap*; Inb. *chakúkap*; Sbl. *dakúkap*, palm, sole.

b: Bis., Bis.-M., Bkl., Ifg., Pamp., Sbn., Tag. *pálad*; Mda. *pái-ad*; Ib. *pálak*.

71. pig; a, *bá-bui*; b, *bá-bui*; c, *bá-bui*.

Bgb., Bis., Bis.-M., Bnu., Ifg., Ilk., Klm., Mda., Mgd., Mnb., Pang., Sbl., Sbn., Sul., Tag. *bábui* or *báboi*; Ib. *bávui*.

72. pocket-belt; a, *hág-kos*; b, —; c, —.

Bkl. *hagkós* (fide Lisboa, also *harikós*), waist band, belt; Bkl. *likós*, circumference; Bkl. *iksán* (fide Lisboa, *katiksán*), waist; Bkl. *takós*, diameter (?); Bis. *bagkós*, belt; Bis.-M. *bágkus*, id.; Sbn. *bakós*, Bon. J. *wákis*, girdle; Bon. J. C. *akósan*, woman's girdle; Bon. C. *wakós*, woven bark girdle; Mnb. *bákus*, *bagákis*, belt; Bkl. *bugkús*, Tag. *bighis*, tie (piece of cord rattan, etc., used for tying a bale or bundle); Bis.-M., Mda., Mnb. *búgut*, to tie in a knot. (See also coat.)

73. red; a, *ma-ra-rá*; b, *ma-pu-lá*; c, *ka-dim-ba-hin*.

a: Bon., Ifg., Tifg. *dala*, blood; Ib. *daga*, id.; Tir. *dara*, id.; Kk. *mandada*; Mgd. *mariga*.

b: Bis.-M. *mapuá*; Bis.-L. *mapurá*; Bis.-I., Bkl., Tag. *mapulá*; Mnb. *mapúya*; Sul. *polah*.

c: Bgb. *liba*, to dye; Bis. *limba*, red, to dye red; Ib. *labba*, red; Mda., Mnb. *liba*, to dye red.

74. rice; a, *bi-nu-gás*; b, *bu-gás*; c, *bi-gás*.

Bkl., Lk. *bagás*; Ib. *baggá*; Bis., Bis.-M., Mda., Sbn.-Dum. *bugás*; Sbn. *bogás*; Ifg. *bóga*, *bógax*; Sbl. *buyáh*; Bnu., Mnb. *dugás*. (See also *kabuksi* under white.)

75. right; a, *si-kón*; b, *pa-ma-lánŋ*; c, *tak-su-kún*.

a, b: Ban., Lep. *awan*; Ifg. *wáwan*; Btn., Pamp. *wanan*; Bgb., Mgd. *kawáwan*; Tir. *kuonon*; Ilk. *kandáwan*; Tag. *kánan*.

In these forms appears the common stem *wan*, frequently with prefix *ka-*; Tag. *kan-*, Tir. *kuon-*, and Mgy. *-kon* or *-kun* are probably all contractions of this compound; Mgy., instead of a suffix *-an*, has made use of a prefix, with the addition, in the last form, of another prefix, *tak-*. This last is probably the same as *tag-* in *tagwalu* (see left) the *g* being changed to *k* by the influence of the following *s*.

? b: Bis. I. *tádluŋŋ*.

76. river; a, *sá-pa*; b1, *sá-lug*; b2, *sá-pa*; c, *li-buŋŋ*.

a, b2: Bis., Bis.-M., Bkl., Tag. *sápa*, creek; Pamp. *sápa*, id.; Sbn. *sapa-sapa*, id.

b1: Bis., Pamp., Sbl., Tag. *ilog* or *ilug*; Ilk. *ilog*, creek; Bkl. *sálog*; Bkl. L. *ilog*, channel, *ilig*, to flow.

c: Ifg. *libónŋ*, *lóbbonŋ*, deep pool, lake, sea, ocean; Bkl., Sbl. *libtónŋ*, deep pool in river; Ifg. *litiŋŋ*, water. See also *lubúŋŋ* under water.)

77. rock; a, *i-li*; b, *ba-to*; c, *ba-to*.

a: Bkl. L. *il'i*, salt as hard as rock; Ilk. *dili*; ? Bis., Tag. *bantilis*, a kind of rock (Romualdez, Bis. Grammar, p. 128); Bkl. L. *bantiris*, rock (in poetry).

b, c: Ae. and Sbl. (six dialects), Bis., Bnu., Ib., Ifg., Inb., Mnb., Sbn., Tag. *bato* or *batu* (with var. acc.); Bis.-M., Mda., Sbl. *bató*.

78. run; a, ———; b, *da-la-gán*; c, ———.

Bis., Bkl., Tag. *dalágan*; Bis.-M., Bnu., Mda., Sul. *dágan*; Bis., Bkl., Pamp. *dálan*, path; Bis.-M., Sbl., Tag. *dáan*, path, road, to go, to pass; Ifg. *dálan*, path, *dumálan*, to walk; Bnu., Mda., Mnb. *dan*, *dáyan*, path. (See also walk.)

Evidently a reduplicated form exactly parallel to Bis., Tag. *dalága*, Bkl. *darága*, Klm. *darala*, girl, from Mal. *dara*, Mgd. *raga*. [Conant, RGH Law, *Journ. Am. Oriental Soc.* (1910-11), 31, pt. 1, 74.]

79. salt; a, ———; b, *asin*; c, *asin*.

Ban., Bgb., Bis., Bis.-M., Bnu., Bon. S. J. C., Gin. S., Ib., Ilk., Inb., Knk., Lep., Mda., Mnb., Pamp., Pang., Sbl., Sbn., Sul., Tag. *asin* or *ásin*; Ifg. *ahín*.

80. sea; a, *dá-gat*; b, *dá-gat*; c, *da-gat*.

Bis. *dága'*; Bkl., Bis.-M., Bnu., Mda., Mnb., Sbn.-NR., Sbn.-Dum., Tag. *dágat*.

81. short; a, *dag-úd*; b, *ka-bös-to*; c, *pon-dók*.

? a: Ifg. *háh-dád*; Pamp. *makúyad*; Sbl. *maantór* or *maantód*.

b: No cognate material found.

c: Bkl., Pamp., Sbl., Tag. *pandák*, short (i. e., not tall).

82. sky; a, *lañg-it*; b, *láng-it*; c, *hi-wáñg*.

a, b: Pan., Bgb., Bis., Bis.-M., Bkl., Bnu., Ilk., Kim., Mda., Mgd., Mnb., Pang., Sbl., Sbn., Sul., Tag. *lángit*; Ib. *lañgi't*; Inb. *dañgit*; Sbl.-Bol. *rángit*.

? c: Knk. *kayañg*, sky; Inb. *akayañg* high.

83. sleep, to; a, ———; b, *a-ka-lu-kán*; c, ———.

Bis. I., Bkl. *lukó*, to lie down (used of animals); Bkl., Pamp. *lúkub*, to lie or sit down, cover the eggs or chicks, brood; Sbl.-Bol. *márek*; Sbl.-Iba. *málek*; Sbl. *alók*, to sleep, *kakalokán*, bed, sleeping-place; Ifg. *málok*, *kalókan*, id., id.

84. small; a, *dí-it*; b, *i-bon-tó*; c, *siñg-it* (*siñg-gít*? E. E. S.).

a: Bis.-I. *diótai*; Bis.-L. *gutiai*; Bkl. *sadit*; Bkl. *dút*, *dikit*, a little; Bon. C. *akit*; Ib. *baddi'*; Ilk. *basít*; Tag. *malít*.

b: No cognate material found.

? c: Tag. *malvñgít*.

85. snake; a, *ú-lai*; b, *útan*; c, *ta-láu*.

a: Bkl. L. *hólag*, big snake; Ib. *iráu*; Ib. *ulag*, rat; Ifg. *úlóg*; Ilk. *úleg*; Inb. *ireu*, big snake, *uloeg*, small snake; Kim. *irao*; Pamp. *ulai*, worm; Sbl. *úlai*; Tag. *ólai*, intestinal worm.

b: No cognate material found.

c: This is the same as the Nauhan word for "neck"; probably due to interpreter understanding the question "What is 'snake'?" as "What is 'neck'?" This will not appear improbable to any one who has noticed the difficulty many Filipinos have in distinguishing between the English long *a* and short *e*.

86. spear; a, *hu-nú*; b, *si-bat*; c, *si-bat*.
 a: No cognate material found.
 b, c: Bkl. L. *sibatsibat*, barbs of palm wood arrow; Ifg. *hibat*, barb; Pamp. *sibat*; Sbl. *hibát*, dart, lance; Sbn.-Dum. *sōbat*, spear with detachable head; Bkl. L. *hibát*, to cut on a slant.
87. spring; a, *bul-bú-gan*; b, *tú-bu-san*; c, *bu-kál*.
 a: Bis.-M. *tuburán*; Bis.-M., Bkl. *tubúd*, to flow, spring, bubble up; Bkl. *buru'buru'*, to bubble; Bon. J. *ibig*; Bon. C. *ōbōb*; Ifg. *ábáb*, *ōbōb*; Ilk. *ubbág*; Mda. *tubúd*; Mnb. *tubudán*; Pamp., Tag. *sibul*; Sbl. *kubúl*; Sbn. *tubud*.
 b: Perhaps this is from the same root *bug*=*bud*=*bur*=*bul* found in words under a; Bkl. has many forms where *r*=*s*, especially such reduplications as *kiri'kisi'*, to rub between the fingers, *orokósok*, the rushing sounds of water, etc.; Ae.-Bat. has *sanum* for *danum*=*ranum*=*lanum*, water.
 c: Pamp., Tag. *bukál*; Sbn.-Dum. *buál*; Bkl. L. *bukalbukál*, to bubble; Sbl. *bukal-bukál*, bubbling spring.
88. star; a, *pam-ga-sán*; b, *ma-gi-rum*; c, *ga-lai-mai*.
 a, b: No cognate material found.
 c: No Phil. material found, but (?) Amblaw *maralai* (Wallace, Mal. Arch., p. 487).
89. stomach; a, *ti-án*; b, *bo-yoñy*; c, *pu-nú*.
 a: Bis., Ilk., Sbl., Sul., Tag. *tián*, belly; Bis.-M. *tián*, *tídyan*; Pamp. *atión*, id.
 b: Bon. J. *fuáñy*, intestines; Gin. M., Ting. *buáñy*, id.; Inb. *biruñy*, bladder of fish; Ifg. *biduñy*, bladder; Bkl. L. *búyoñy*, corpulence.
 c: No cognate material found.
90. sun; a, *i-nít*; b, *al-dáo*; c, *ma-i-búñy*.
 a: See hot.
 b: See day.
 c: See afternoon and hot.
91. sunrise; a1, *mak-súrip-súrip*; a2, *mag-siñy-gít*; b, *u-ma-ga*; c, *u-bas-tú*.
 a1: Bkl. *sir'ip*, to peer, peep, look out or in; Pamp., Tag. *silip*, id.; Bis.-M., Mda. *silib*, id.; Ifg.; *hilip*, sunset. (See also *magsálup* under sunset.)
 a2: Bkl. L. *riñy-gít*, great heat of the sun.
 b: Bis., Bkl., Tag. *ága*, morning, to dawn, verbal prefix *um*.
 c: Pamp., Tag. *búkas*; Mda., Mnb. *búkas*, dawn; Inb. *kabuásan*, to-morrow, *buastó*, day after to-morrow; Bon. J. *aswakus*, to-morrow; Ilk. *to*, a demonstrative particle denoting futurity. (See also to-morrow.)
92. sunset; a, *mag-sál-up*; b, *mad-lum-ani*; c, *ba-ya-pín*.
 a: Bis.-M. *sálup*, to set; Bis.-A., Mda., Mnb. *sáup*, *sáyup*, id.; Mda., Mnb. *sayupán*, West; Bkl. *sulnóp*, to set, *sulnópan*, West; Sbl. *hunlóp*, to disappear; Sbn. *sindóp góndau*, Sbn.-NR. *sindápan*, West.
 It seems that the same root runs through the words cited here and under sunrise, a.

b: See *madlám* under night; for the ending *-ani* see note under afternoon and compare *kapuni* under yesterday.

c: See *girapmanani* under afternoon.

93. there; a, *á-ti*; b, *am-ba-sa-tá*; c, *bal-yó*.

a: Bis.-M. *didto*, *ídto*, *sádto*, *yádto*; Bon. J. C. *ischi*; Ifg. *hidi*; Sbl.-Bol., Sbl. *Iba iti*, here, Sbl. *itáu*.

These forms are given tentatively, as resembling somewhat the Mgy. *ati*. The difficulty of tracing the three common adverbs of place has already been referred to under here. In this case it is increased by the fact that it is not specified whether the English word is "there (near the person addressed)" or "there (distant from both speaker and person spoken to)," a distinction that is quite definite in most, if not all, Philippine languages.

b: No cognate material found, except (?) Mda. *desidto*

c: Bkl. *balíó*, Ilk. *ballu*, the other side, opposite bank, etc.

94. they; a, *sida*; b, *urá-boo*; c, ———.

a: Bis. *sirá*, *silá*; Bkl. *sindá*; Ifg. *didá*; Sbl. *hilá*; Tag. *silá*.

b: Ibk. *irá*; Inb. *era*; Pang. *ira*; Bkl. *bió'*, all, whole; Tag. *boó'*, id.; Ibk. *big*, all, nothing but; Ilk., Pang. *biig*.

This compound form is perhaps not the one commonly employed, but due to the interpreter emphasizing the fact that he wanted the equivalent not of Tag. *siá*, "he," but of *silá lahát*, "they all."

95. thou; a, *ká-wo*; b, *ká-wo*; c, *ka-but-yák*.

a, b: Bis., Bis.-M., Mda. *ikáu*; Bkl. *iká*; Bon. C. *siká*; Ibk. *sikáu*; Ilk. *siká*; Inb. *sikam*; Sbl. *liká*.

c: No cognate material found; cp. *baginǵyák* under I.

96. to-day; a, *ta-inǵ-úna-pag-sí-raǵ*; b, *baǵ-úna*; c, *tak-tuǵ*.

a, b: Bis., Bis.-M., Mda., Bkl., Bnu., Mda., Mnb., Sul., Tag. *báǵyon*, to rise, "get up"; Ibk. *máǵun*, id.; Ifg. *báǵun*, id.; Bon. C. *fumaǵun*, id. (for *pagsiraǵ* see *siraǵ* under day).

It seems scarcely probable that so long a phrase as that given under "a" should be the only way of expressing the idea "to-day," but Doctor Miller says he questioned his interpreter very insistently and was not able to obtain any other expression.

c: No cognate material found.

97. to-morrow; a, *al-dáu*; b, *gi-ra-bas*; c, *a-lu-bás*.

a: The use of *aldáu*, "day", "sun", for "to-morrow" is, as far as I know, unique; Bkl. has, however, *nu-sárong aldáu*, "on the other day" for "day after to-morrow."

b, c: See *ubastú* under sunrise.

98. tooth; a, *nyí-pon*; b, *ni-pön*; c, *nyí-pin*.

Bgb., Bis., Bis.-M., Bkl. Sbl. *ñgípon*; Ibk. *ñgípan*; Ilk., Mda. *ñgípen*; Pamp. *ípan*; Pang. *ñgípoen*; Tag. *ñgípin*; Dmg. *nípon*.

99. tree; a, *ká-yo*; b, *ká-yo*; c, *ka-yó*.

Bis., Bkl., Tag. *káhoi*; Bis.-M. *káhu*; Ib., Ilk., Sbl.-Bol. *káyo*; Bon. C., Mda. *kain*; Sbl. *káyo*, wood, *póon-káyo*, tree; Ifg. *ka'yu*; Mnb. *kádo* or *kájo*.

The distinction made in Sbl. between "tree" and "wood" is one that, where there is any danger of ambiguity, must be made in many Philippine and other IN languages, the word *kayu* meaning both "tree" and "wood" in perhaps a majority of the languages where it occurs.

100. ubi; "a, *ubi*; b, *ubi*; c, *ubi*.

Bis., Bkl., Ifg., Ilk., Sbl., Tag. *ubi*; Mal. *ubi*, tuber.

101. up; a, *a-buát*; b, *sañy-a-wai*; c, *tag-bús*.

a: Bis., Bkl., Tag. *búhat*, to raise, lift; Pamp. *búat*, id.

? b: Sbl. *tá'gai*, up, above.

c: No cognate material found.

102. walk; a, ———; b, *mañy-a-dan*; c, ———.

See *dalágan* under run.

103. water; a, *da-núm*; b, *sá-pa*; c, *lu-búny*.

a: Ban., Bon. S., Btn., Gin. S., Ib., Ilk., Knk., Lep., Pamp., Pang. *danúm* or *dánúm*; Ifg. *dánúm*, juice, liquid; Sbl. *lanúm*; Bon. J. *chenum*; Bon. C., Inb. *chanum*.

This word for "water" is undoubtedly connected with the very general Phil. *inum*, *inom*, "to drink". *Danum* is exceptional in its strikingly uniform geographical distribution, all the languages north of Tag., as far as I know, without exception, having it, while all languages from Tag. southward have words from the root *ig*. Ifg., however, has the word in a different sense, "water" being *litiny*.

b: See *sápa* under river.

c: See *libúny* under river.

104. where; a, *na-án*; b, *sa-ro-ba-tái*; c, *ag du*.

a: Bis. L. *háen*; Bis.-M. *hain*; Bis.-I. *diin*; Bkl. *haén*, *saén*; Ifg. *dáan*; Mda. *wain*; Tag. *saán*.

b: No cognate material found.

? c: Bon. C. *ento*; Sbl. *aiti*.

105. white; a, *ma-lag-tí*; b, *ma-pú tí*; c, *ka-buk-sí*.

a, c: These two forms seem to belong to a very widely distributed and extremely variable series of words (derived from a root *gas* = *das* = *ras* = *las*?) having such meanings as: white, bleached, faded, refined, yellow, blond, pale, light, etc. More than forty such terms, not counting numerous plant names, are known to me, of which the most characteristic are cited: Pamp. *das-dás*, Tag. *dig'ás*, Bkl. *dagás*, Bis. *dug'ás*, to blanch rice; Bkl. L. *bugáse* exceeding whiteness; Tir. *rasi-rasi*, very white; Bis. *duak*, light color; Bgb. *daddas*, to fade; Pamp., Tag. *busilak*, whiteness; Tag. *busák*, exceeding whiteness; Bis. *buság*, white;

¹⁶ The Tag. name of a yam (*Dioscorea alata* L.), but probably applied in various regions also to other species of the same genus.

Tir. *buse*," blond, *busoc*, dark blond; Ting. *nabutaak*, white; Bkl. *luñgasi*, *luñgsi*, pallid; Tir. *melusi*, *menlusi*, id.; Tag. *bigás* and cognate forms. (See rice.)

b: Bis., Bis.-M., Bkl., Bnu., Mda., Mnb., Pamp., Sbl., Tag. *maputi*; Inb. *amputi*; Ilk. *púti* (of cloth and yarn only); Tir. *futè*; Sbn. *gõmputi*.

106. woman; a, *ba-bá-ye*; b, *ba-bái*; c, *ba-i*.

Ban., Bis.-M., Ibk., Ilk., Bon. S., Gin. S., Klm., Knk., Lep., Mgd., Pamp., Sbl., Sul., Tag., Tinġ-. *babai*, *babá-i* or *babác*; Bis., Bkl., *babáye*; Ifg. *baba'-i*; Inb., Pang. *bti*; Bgb. *bai*, *báie*; Pang. *bai*, grandmother; Bnu. *buyáu*; Mda. *búbai*; Mnb. *bukí*.

107. work; a, ———; b, *pa-ma-na-win*; c, ———.

No cognate material found, unless from **pama-gawa-in* <Tag. *gawá*, to make, do, work.

108. wrist; a1, *ka-la-san*; a2, *ka-ma-óo*; b1, *ka-ro-rá-yan*; b2, *pa-ma-da-án*; c, *pai-lu-pu-hán*.

a1: No cognate material found.

a2: Bkl. *kamaóo*, back of hand; Pamp. *kamaón*, id.

b, c: No cognate material found.

109. yesterday; a, *ka-aldáu*, b, *na-á-pon*; c, *ka-pu-ni*.

a: The use of the preposition *ka* to form adverbial phrases referring to past time is common, e. g., Bkl. *kasuúdma*, yesterday, *kasu-báñgi*, last night, etc., Tag. *kagab'i*, yesterday; for the use of *aldáu* here, compare *aldáu*, to-morrow.

b, c: Bis.-A. *kahápon*; Bkl. *kahapon*; Pamp. *nápun*; Sbl. *na-ápon*.

See afternoon; for ending *-i*, compare *girapunani* under afternoon and *madlumani* under sunset.

¹¹ Orthography of Bennásar, Diccionario Tiruray-Español. Manila (1892); *ë* is pronounced as French *é* final. Conant, "F" and "V" in Phil. Languages, *Pub. P. I. Bur. Sci., Div. Ethnol.* (1908), 5, 186.

NUMERALS.

ENGLISH.	a, BULALAKAO.	b, ABRA DE ILOG.
one	usá ^a	isa
two	duá	dalawa
three	tuló	tatlo
four	upat ^b	apat
five	líma	lima
six	unúm ^c	anim
seven	pitó	pito
eight	waló	walo
nine	siám	siam
ten	sampólo	sampo
eleven	sampolo-ma-usa	labing-isa
twelve	sampolo-ma-dua	labing-dalawa
twenty	dua-polo	dalawan-po
twenty-one	dua-polo-ma-usa	dalawanpot-isa
thirty	—	tatlong-po
forty	upat-polo	apat-na-po
fifty	liman-polo	limam-po
sixty	unum-polo	anim-na-po
seventy	pitung-polo	pitom-po
eighty	walung-polo	walum-po
ninety	siam polo	siam-na-po
one hundred	sampolo kasikapat ^d	isang-daan

^a Both the Samar-Leyte and the Cebu Bis. have *usa*.

^b Samar-Leyte *oopat*, Cebu *upat*.

^c Samar and Leyte *oonum*, Cebu *unum*.

^d This form is incomprehensible to me except on the supposition that Doctor Miller's informant was thinking, not in abstract numbers, but in terms of money. *Sikapat* in Bis., Bkl., Tag., and many others is "the fourth part (of the *salapi* or half peso)," i. e. Span. *un real*. There must have been widely known in the Islands a unit of value called *salapi* (Skt. *rupya* Eng. rupee; see Tavera, *El Sanscrito en la Lengua Tagalog*, Paris, 1887) which was approximately equal to a half peso at the time of the Spanish conquest, for most of the native ways of counting money are based on the half peso and the real. The Spanish-Philippine peso consisted of eight reales, but the *duro* or *peso fuerte* of Spain was worth ten reales and it does not seem improbable that this system might have been in use locally at one time or another. Also Tavera, *op. cit.*, gives: "*isang salapi, moneda de cuatro reales fuertes (diez reales de vellon) ó sea medio duro*". Now the fact that the peso was divided into five pesetas or one hundred centavos was already pretty well known during the Spanish régime, to say nothing of the universal spread of the new coinage established under the American government. Therefore, it seems not very improbable that the Mangyan in question, thinking of "one hundred" had a vague mental notion of that number of centavos and so said: "That's *sampolo kasikapat*" (ten reales).

THE OLIGOCHAETA TERRICOLÆ OF THE PHILIPPINES.
PART I, THE GENUS PHERETIMA.

By FRANK E. BEDDARD.
(London, England.)

The Director of the Bureau of Science of the Government of the Philippine Islands has been so good as to forward to me a number of bottles and tubes containing a large series of earthworms, collected in the Philippine Islands and under his direction, with a request that I would examine and report upon them. I am very grateful to the Director for this opportunity. I desire also to offer my thanks to the gentleman, Mr. R. C. McGregor, assistant in the Bureau of Science, who collected the specimens upon which I here report, which proved to be in excellent condition for investigation.

The collection forwarded to me contains a considerable number of new species of *Pheretima* upon which I write in the present communication. However, the account which I give does not deal with all of the species of that genus contained in the collection. There were in addition to those described in the following pages several examples of a species which I refer with some doubt to *P. montana*, and a single, large, not fully mature specimen which I was unable to place with accuracy. I propose to defer the consideration of these two species until I receive more specimens.

All of the new species described in the present paper are based upon specimens from the Island of Luzon.

Although the genus *Pheretima* forms the bulk of this collection, there are also specimens, or at least 1 example, of a species of *Pleionogaster*, and some small worms belonging to the genus *Benhamia*. I intend, in the present communication, to concern myself only with the genus *Pheretima*, leaving the other genera to be dealt with in successive reports, in the course of which I propose to deal, also, with the species already described as natives of the Philippine Islands. There will thus result, I hope, a fairly complete account of the earthworm fauna of this part of the world.

Pheretima decipiens sp. nov.

The species of *Pheretima* which I describe here under the above name is not, I am compelled to admit, to be certainly regarded as a new species. Nevertheless, after a careful consideration of the literature, I feel quite unable to identify it positively with any other species. The only alternative, therefore, is to give it a new name. The identification of the members of this genus is becoming a very difficult task. This is largely due to the omission in some earlier records of characters now, but not then, known to be of considerable importance in the discrimination of species, and also to the fact that many species have been founded upon one individual, or at least upon the dissection of but one individual. That there are anatomical variations, a study of the present and of other species fully demonstrates. *Pheretima decipiens* belongs to that group of species of the genus which is characterized by the following assemblage of important and diagnostic characters: There are no setæ upon the clitellum which occupies the whole of segments XIV—XVI; there are no traces of genital papillæ; the male pores are large and rather far apart, being separated by some 8 setæ; the spermiducal glands are relatively small, are contained within the XVIIIth segment, and open to the exterior by means of a large bursa copulatrix; cæca are present; spermathecæ, more than 1 pair. I make a point of leaving out the more exact characterization of the spermathecæ in this preliminary diagnosis, since I find them to vary in the species which is at present under discussion.

But with this limitation, there are only the following species, besides the present, which agree in the characters enumerated above. They are *P. philippina* Rosa,¹ *P. pura* Rosa,² and an assemblage of "species" which I have dealt with in my revision³ of this genus under the name of "*Amyntas cingulatus*." I have included in the latter assemblage species which have been described as *P. cingulata* Vaillant (in part), *P. darnleiensis* Fletcher, *P. vaillanti* Beddard, *P. martensi* Michaelsen, *P. indica* Horst, *P. eoa* Rosa, *P. madelinæ* Benham, *P. padasensis* var. *lokonensis* Michaelsen, and *P. belli* Rosa. Michaelsen, on the other hand, who reviewed the genus at about the same time as myself, arranges these 9 "species" into the following: *P. martensi* (including *P. eoa*), *P. vaillanti*, *P. darnleiensis*, *P. belli*, *P. padasensis* var. *lokonensis*, *P. padasensis* var. *made-*

¹ *Ann. k. k. Nat. Hofmus.* (1891), 6, 397.

² *Ann. & Mag. Nat. Hist.* (1898), II, 7, 285.

³ *Proc. Zool. Soc. London* (1900), 615.

linæ, and places *P. cingulata* as a synonym of both *P. robusta* and *P. quadragenaria*. He thus differs greatly from me.

I am still not in agreement with Michaelsen's reasons for regarding as different *P. martensi* with which must be regarded as synonymous *P. eoa*; for, although in most of the examples of the species which I am now considering I never saw the small accessory diverticulum upon the duct of the diverticulum which characterises *P. martensi*, it did occur in one individual. On the other hand, the noticeably larger setæ distinguishes my species. Rosa says nothing of this in describing *P. eoa*, nor does Michaelsen in his monograph of the group in Das Thierreich.

It is also this character, that is, the large size of the setæ of the first 8 segments, which leads me to regard the present species as differing from the others of the *P. cingulata* group. The number of spermathecæ (although I found only 3 pairs in one individual) serves to differentiate *P. decipiens* from *P. philippina* and *P. pura*. There remains, however, the undoubted fact that the present species is very near to the "*P. cingulata*" group, and further examination of the species referred to that group may prove an identity with *P. decipiens* which at present is not quite plain.

The most salient external character of the present species is one in which it agrees with *Pheretima benguetensis*; namely, the large setæ of the anterior segments of the body; their arrangement in the present species appears to be identical with that in *P. benguetensis*. That is, after the IXth segment the setæ suddenly diminish in size as compared with those on that segment. This character is very obvious and needs no careful examination for its demonstration. In its other external characters, also, *Pheretima decipiens* seems to be exactly like *P. benguetensis*. It has a clitellum of fully 3 segments without any setæ thereon; there are no genital papillæ. The male pores are separated by from 6 to 8 setæ and each lies at the level of about the eighth setæ. The reason for the apparent discrepancy in the above remarks is that the pores are large and there are no setæ close to the inside of each pore on the XVIIth segment. The dorsal pores and the oviducal aperture are precisely as in *P. benguetensis*. In regard to the alimentary canal, the large intestine undoubtedly commences in segment XVI. When the intestine in this segment is cut open, the narrow œsophagus can be seen to open onto a median, valvular projection into the lumen of the large intestine. The cæca are conspicuous, but

only moderately long, not so long as in the examples of *P. benguetensis*. The spermathecae differ from those of the large worms with which the present worm is compared mainly by the fact that the diverticulum is not so long as is the spermatheca itself. There are, also, some differences among individuals. In 1 specimen there was, as already mentioned, a small accessory diverticulum; in 2 other individuals the VIIth segment contained 2 spermathecae at any rate on one side of the body; of these, one opened on the intersegmental furrow VI/VII, the other on VII/VIII, so that *externally* there was no variation from the normal. In one there were only 3 pairs. The ovaries lie in segment XIII and are particularly large and of a bushy appearance. The same segment, also, contains a considerable number of large *monocysts*. Both ovaries were removed and placed upon a slide and away with them came a number of these monocysts which were clearly attached to the ovaries. This is a very remarkable point of likeness between this species and the next that the XIIIth segment of *Pheretima benguetensis* also contains a group of large gregarines apparently quite similar to those of *P. decipiens*. But in *P. benguetensis* the ovaries were small, although easily recognizable, and a pair of sacs was found close to them which may be sperm sacs or ovisacs, whereas in *P. decipiens* those sacs if present must have been very small. The sperm sacs lie in segments XI and XII and are about equisized. Each has a free projecting lobe as in *P. benguetensis* and various other species. In the present species these free projecting lobes are asymmetrical. Of the posterior pair of sperm sacs, that on the right is the longer; the converse is the case with the anterior pair. These appendices do not cap the sperm sacs as in the species with which I am particularly comparing *Pheretima decipiens*, for the sperm sacs grow up on either side beyond the origin of the appendices. It is probable, however, that morphologically their position is the same. The sperm reservoirs appear to be much the same as in *P. benguetensis*. There is, however, a difference as regards the sperm-duct funnels. These latter are obviously dependent into the sacs from the septa, a difference which may be due to smallness of size of the present species.

The spermiducal glands and the terminal bursa copulatrix are very like those of *P. benguetensis*. They vary somewhat in different individuals of the present species. The gland has the same compact form and semicircular, or horeshoe-like, out-

line and it closely embraces the bursa. The duct opening into the bursa varies in form. In one example it was quite straight, and therefore very short, thus contrasting with that of *P. benguetensis*. In others, however, there were varying degrees of curvature in this duct, and corresponding to this a slight difference in the actual point of opening into the terminal bursa. The sperm ducts can be seen to unite where they approach their opening into the spermiducal duct as in *P. benguetensis*.

Pheretima benguetensis sp. nov.

Collected like the last species at an altitude of 1,524 meters in the Province of Benguet, Luzon, were several examples of a large *Pheretima* which is undoubtedly like the last species in many particulars, but which I am nevertheless disposed to regard as distinct from *P. decipiens*.

TABLE I.—Measurements of the four large specimens of *Pheretima benguetensis*.

Length.	Diameter.	
	Anterior.	Posterior.
mm.	mm.	mm.
190	12.5	10.00
150	12.0	9.75
158	11.5	9.00
138	11.5	9.00

Thus the length may be fairly described as 190 millimeters and the diameter at the head as 12.5 millimeters. The measurements of length, however, are obviously only approximate, for in one of the longer and one of the shorter individuals the last segment of the body bore a complete circle of large setæ, and the anus showed signs of regeneration. In the other two, on the contrary, the last 2 or 3 segments bore no setæ, and the anus presented a normal appearance. The former, therefore, have clearly been injured during life and were originally some segments longer. The color of the large individuals was in every case dark purplish-blue on the dorsal surface, passing into pale brown ventrally. Dorsally, an iridescence was plainly visible in certain lights.

The segmentation of the body offers certain features which are characteristic. The first 9 segments of the body form a kind of "head" which is very sharply marked off from the rest

of the body. The segments are very distinct from each other, and convex, suggesting in general appearance the "rattle" of a rattlesnake. The setæ, which are larger upon these segments than upon the Xth and following segments, are implanted upon a prominent ridge which looks slightly backward. The setæ themselves are certainly directed backward. This state of affairs is plainly shown in the accompanying figure (Plate I, fig. 1) and is an exaggeration of what occurs in some other species of *Pheretima*. It is, however, a very distinctive mark of the present species as compared with others dealt with in this account of the earthworms of the Philippines with the exception of its close ally *P. decipiens*. The segments which follow, suddenly change their character. The first 4 of those; that is, segments X—XIII, are equisized and of about equal diameter, as a matter of fact, with any of the last 2 or 3 of the "head" series. While the latter are hardly divided into secondary annuli, the segments X—XIII are each composed of at least 3 distinct annuli of which the middle one bears the setæ implanted upon a slight ridge. This secondary annulation is of some importance because it is usually dealt with in giving the characters of various species. It is clear from the conditions met with in this *Pheretima* that the number of secondary annuli is a character which must be made use of with caution. For in one individual there were 3 annuli, and 3 only, to each of segments X, XI, XII, XIII. In two others, however, the anterior annulus was divided into two, and there were thus 4 annuli to each segment. The fourth specimen was too much stretched to permit of accurate observation. In 2 individuals the clitellar segments were plainly visible through the immaturity of the clitellum, and these segments, much narrower than the preceding, were made up of only 2 annuli each.

The clitellum occupies the whole of segments XIV—XVI, beginning with the furrow separating segments XIII/XIV and ending with the furrow separating segments XVI/XVII. When fully developed, no segmental boundaries are visible upon it; but the dorsal pores are visible and thus define the individual segments externally. Nor is there any trace of setæ that I could discover. This absence of setæ applies not only to the fully developed clitellum, but to the clitellum of less developed specimens. The 4 examples which I have studied illustrate the growth in length of the clitellum as it becomes mature. In two the clitellum showed plainly the boundary lines of its component segments and was not quite so long as the preceding

segments XII and XIII. In the 2 remaining, fully mature examples, the clitellum was rather longer than those 2 segments taken together.

The dorsal pores certainly commence between segments XII/XIII. Earlier than this, I have not been able to recognize them. They are obvious, as already mentioned, upon the clitellum, and they extend to the very end of the body. I found a perfectly well-marked dorsal pore between the preanal and the perianal segments. *Genital papillæ* are entirely wanting in this species.

Of the intersegmental septa it may be said that none of them is very greatly thickened, yet some of the anterior septa are distinctly thicker than others. The first recognizable and definite septum divides segments IV/V; this and the two following septa are slightly thickened as compared with those in the posterior region of the body. Between VII/VIII is a delicate, thin septum contrasting with the foregoing. The VIIIth, IXth, and Xth segments, in which of course lies the gizzard, are not separated by septa at all,⁴ and the intersegmental boundaries are the only limits of the segments in question in the gizzard region. The septa dividing X/XI and the 3 following segments are somewhat thickened and equally so. Thereafter, the septa are delicate to the end of the body.

Certain features in the alimentary canal of this genus serve to discriminate species from species. Therefore, I shall direct attention to the general anatomy of the gut, though several of the facts to which I shall refer have not yet been made use of in definitions of species and are not yet known to vary. The gizzard belongs presumably to segment VIII as in other members of the genus; it is elongated and barrel-shaped, being longer than broad. After the gizzard, and extending to the end of the XIIIth segment, is a very vascular section of the œsophagus which doubtless represents potentially the calciferous glands of other earthworms in which these glands occur; they appear to be always absent in the genus *Pheretima*. In XIV, XV, and XVI, the œsophagus is narrower and not vascular or, at least, not so markedly vascular as anteriorly. The wide intestine begins in the XVIIth segment. Some discrepancy will be noticed between this enumeration and that of other writers. The large intestine has been variously described as commencing in the XVth or XVIth segment. It may be that this statement is

⁴ It is probable, of course, that the wall of the testicular sacs represent a portion of the otherwise missing septum IX/X.

more correct than that which I have first made with respect to *Pheretima benguetensis*, for the section of the gut which lies in the XVth segment, although much narrower than that which ensues and thus more like the preceding section of œsophagus, is of the same brown tint as is the large intestine. The large intestine has a shallow typhlosole and a pair of long cæca. These appear to arise in the XXVth segment and, when fully extended forward, to reach as far as the XXth segment. They are thus rather long.

The testes are contained within the testicular sacs, to be described presently in connection with the sperm sacs, and can be brought readily into view by opening those sacs and washing away the adhering masses of sperm. It is noteworthy that the anterior testis is the smaller and that its position is a little different from that of the posterior male gonad. The anterior testis lies nearer to the middle ventral line of the body. It is, also, to be noted that the posterior testis does not lie around or quite close to the vas deferens as it emerges from the Xth segment, as is frequently the case among earthworms. This testis is distinctly farther from the middle line ventrally than is the anterior testis and is thus not in contact with the vas deferens belonging to the anterior testis.

The sperm-duct funnels of this *Pheretima* are represented in Plate I, fig. 2. It will be seen that the two of one side of the body, anterior and posterior, are equisized. Furthermore, it is to be noted that they do not hang from the septa into the interior of their respective segments, as is the case with many earthworms. The funnels lie flat upon the ventral body wall and their mouths look directly upward. The periphery of the funnel is regularly folded. The 2 sperm ducts are very distinct on each side of the body as two ducts to the actual point of their connection with the duct of the spermiducal gland. It is important to notice this fact since in several species the two ducts of one side fuse immediately behind the posterior funnel. The posterior of the 2 sperm ducts, that is, the one which arises from the funnel of segment XI, runs outside.

There are 2 pairs of sperm sacs situated in segments XI and XII. The posterior pair is very distinctly larger than the anterior pair and is made up of twice as many tubes. The lobate structure of the sperm sacs is very characteristic of this species, and on a more minute examination each lobe is seen to be divided into tiny lobules. Dorsally, each posterior sperm sac (that is, of segment XII) is capped by a lobe of different appearance, which is not subdivided into minute lobules and is

browner as contrasted with the whiter color of the rest of the sperm sac. This peculiar differentiation of the sperm sacs is not unknown in other species of the genus *Pheretima*. Each sperm sac is connected with a sperm reservoir as it has been termed, but for which the term testicular sac seems much more suitable since the testes lie within it.

Ude⁵ has lately called renewed attention to these sacs which present differences in different species. In the species of *Pheretima* now under consideration there is no median fusion between the pairs of testicular sacs. On the other hand, the 2 sacs of each side in those belonging to segments XI and XII are apparently hardly in communication, and unquestionably in contact. When the sacs in question are opened and their contents revealed, the complete separation between all four of them becomes very obvious. When the walls are cut away dorsally the cavity of each sac is seen to be circular in contour. The anterior wall of the anterior pair presumably represents the otherwise entirely missing septum between segments IX/X.

In view of the certain amount of variation met with in the internal structure of *Pheretima decipiens*, it is important to notice that there is practically none in *P. benguetensis*, although this statement must be qualified by the further consideration that I am in a position to report upon only 2 fully mature individuals. In the second of these, I found a precise agreement with the example described above. The appendicular lobe of the sperm sacs, however, originated rather farther down than in the first named individual where each caps its corresponding sac, but in their relative smallness these appendices contrast with those of *Pheretima decipiens*.

The spermiducal glands and the terminal male apparatus lie entirely within the XVIIIth segment, whose septa, however, bulge somewhat laterally to accommodate these male organs. The spermiducal gland is divided into 3 inequized, principal lobes, of which the anterior is the largest, and the middle one the smallest and again subdivided into two. A division of these lobes into equal-sized lobules is also quite plain. The duct of the gland is short and rather swollen, and either straight (running at right angles to the long axis of the body) or slightly bent posteriorly; it opens into a well developed bursa copulatrix of circular area. The vasa deferentia can be traced to their opening at the commencement of the muscular duct of the spermiducal gland, a point which is hidden by the glandular

⁵ Ztschr. f. wiss. Zool. (1905), 83, 405.

tissue. There are no accessory glands in the neighborhood of the "prostates."

The ovaries lie in the XIIIth segment and are not large,⁶ in spite of the fact that the worm is large and fully mature. The position of the ovary on each side is just over the separate sperm ducts of that side where they emerge from the septum.

The spermathecæ are present to the number of 4 pairs in correspondence with the external apertures already described. The main pouch is spherical to oval in contour and there is a distinctly marked distal portion leading to the exterior. The single diverticulum of each spermatheca opens into this duct not far from its external orifice. On the under surface of each spermatheca, near the junction of the thin-walled pouch with the thicker-walled duct, is an adherent tuft of nephridial tubules apparently quite like those which Michaelsen⁷ has figured in his species, *Pheretima martensi*. The diverticulum is longer than the spermatheca and consists of a narrow duct, often coiled upon itself near its end or wrapped around the terminal, cylindrical portion of the spermatheca, and an oval pouch containing the sperm which is much smaller than the spermatheca.

Pheretima orientalis sp. nov.

A number of examples of this species are all small, slender worms, whose color, for the most part, has been removed by the spirit in which they were preserved. They now exhibit a whity-brown color save for the clitellum which is a dark brown. The length is some 98 millimeters; the diameter, 0.75 millimeter. The setæ form perfectly continuous rows upon the segments of the body, there being neither dorsal nor ventral gaps.

The clitellum commences a little posterior to the commencement of segment XIV and extends nearly as far as the setæ of segment XVI, say $\frac{2}{3}$ XIV— $\frac{1}{3}$ XVI. All of its segments have setæ which are quite conspicuous in most cases. Those of the XVIth segment completely encircle the segment, which fact may be correlated with the absence of any glandular development upon the greater part of that segment. There is in fact no reason why the setæ should be absent. I am not so certain whether the setæ form complete circles upon the other segments of the clitellum; however, there is no doubt that they extend in every case for a considerable distance to the right and left of the

⁶ Compare the very large ovaries of *Pheretima decipiens*, a much smaller species.

⁷ *Arch. f. Naturg.* (1892), 13, fig. 20.

ventral median line, and that it is not merely a question here of the persistence of 3 or 4 setæ. It should be noted in relation to this matter that all the 6 examples possessed setæ; thus there is no doubt as to the genuinely specific character of the permanence of setæ upon the clitellum.

The dorsal pores commence on the intersegmental furrow XII/XIII. The oviducal pore or pores (for I could not distinguish the actual orifice or orifices) are borne upon a very conspicuous, transversely oval, field, contrasting by its whitish color with the surrounding brown clitellum. This field, moreover, is delimited by a groove which encircles it. This area, at any rate in those examples where it was most plainly delimited, obviously lies in front of the circle of setæ of segment XIV.

The male pores, as is always the case in those species of *Pheretima* where there is no terminal bursa copulatrix, are not at all conspicuous, and in the present species they are less so, even less than is usually the case, because of the genital papillæ which practically surround them. The pores lie actually in the line of the circle of setæ and are separated from each other by about 8 setæ. They are thus distinctly upon the ventral surface of the body (that is, they are not lateral in position), and in the intact worm there is some space visible to the right or left of each pore as the case may be. The large size of the genital papillæ, which nearly touch in the middle line, gives the erroneous impression that the male pores are closer to each other than is actually the case.

The most noteworthy fact about the intersegmental septa of this species is the presence of a well-developed septum separating segments IX/X. I am disposed to connect the presence of this septum with the existence of a well-developed pair of sperm sacs in segment X; or rather, perhaps, the presence of the latter is to be connected with the existence of this septum. This septum and the two which follow are rather stronger than the rest of those behind; so, too, are intersegmental septa VI/VII and VII/VIII. The septum VIII/IX is absent as a complete septum. I have found traces of it in the form of a muscular band attached to the intersegmental furrow VIII/IX.

The large intestine commenced with the XVth segment. The cæca are not large, but traverse 2 segments. The gizzard is rather elongated.

The last pair of hearts is in segment XII.

The sperm sacs of this species are in 3 pairs, situated respectively in segments X, XI, XII. The sperm reservoirs are not

connected with each other either across the middle line or antero-posteriorly; they are scarcely distinct from the sperm sacs.

I can not distinguish from these examples, which are labeled "Benguet Province, Luzon, altitude 5,000 ft.," others from Pauai in the same province. In particular, the remarkable arrangement of the spermathecae is the same.

The spermiducal glands are rather large and extend through segments XVI—XIX. They vary somewhat in their exact form and in the degree* of lobation of the gland tissue. In cases where the lobation is most pronounced, the gland is divided transversely (that is, to the longitudinal axis of the body) into finger-like, elongated segments; in others, it is subdivided into a greater number of smaller, rounded segments. In fact, there appears to be no very definite type of gland. All that can be said is that the spermiducal gland is much lobate. The duct is long and arises from about the middle of the gland; it first of all runs forward for a variable distance and then bends upon itself and passes backward to its orifice upon the XVIIIth segment. I could discover no trace of a terminal bursa copulatrix.

The spermathecae of this species are very remarkable and quite unlike anything that has fallen within my experience. In one specimen there were 5 pairs of these sacs arranged in the following unusual fashion. The first 4 pairs open between segments IV/V and VII/VIII, respectively. The fifth and last pair open on the next intersegmental furrow; that is, VIII/IX, but are not in line with the preceding pairs; their point of opening is in fact very much nearer to the ventral median line. In a second specimen I could find only 4 pairs of spermathecae of which the last opened to the exterior between segments VIII/IX. These spermathecae in the case of every pair were symmetrical on both sides of the body. Again the spermathecal pores did not open in line. The 2 first on each side were in line with each other at the point of opening which was considerably external to the points of opening to the exterior of the 2 following spermathecae; these latter were in line with each other. In a third example there were 5 spermathecae on the right side of the body of which the last opened to the exterior between segments VIII/IX, and the orifice was much more ventral than those of the 4 anterior spermathecae which were in line. The spermathecae of the opposite side of the body appeared to be entirely symmetrical with these, and there is no doubt that the 2 last spermathecae

* Sometimes with the addition of another segment.

were so. I am disposed to think that the specimen in which I found only 4 pairs of spermathecae had the last pair lost in the course of dissection, but I am not certain. Each spermatheca has a rather long and very narrow muscular duct. The diverticulum, which ends in a club-shaped, distal extremity, is about one-half the length of the spermatheca, and opens into the duct of the latter near its external orifice.

Pheretima albobrunnea sp. nov.

Two examples of a rather slender species of *Pheretima* were collected at the same time and from the same locality as the last species, *Pheretima orientalis*, and were provisionally assigned to that species from which, however, they obviously differ. The color and the general external appearance is identical with those of *P. orientalis*, a fact which led to the original confusion between the two. Further than this the clitellum and its setae and, indeed, all the external characters, with the exception of the male pores and the genital papillae, are precisely as in *P. orientalis*. The male pores, like those of *P. orientalis* and of most if not all species of *Pheretima*, are in the line of setae. They are, however, distinctly farther apart than in the last species and are separated by some 18 to 20 setae. The pores themselves are equally small and inconspicuous. The genital papillae of *Pheretima albobrunnea* are quite different from those of *Pheretima orientalis*; nor can the differences be put down, I think, to greater immaturity in the case of one set of worms or of the other; nor were there intermediate stages between the two. In the present species, the papillae are smaller than in the last, and rather sucker-like, a depression occupying the middle of each papilla. The positions occupied by the papillae are the same; that is, one lies anteriorly and one posteriorly to the male pore, and they are both upon the XVIIIth segment. The difference between these papillae and the large flat papillae of *P. orientalis* is very obvious.

The internal structure of this worm is very like that of *P. orientalis*, but shows, nevertheless, sufficient differences to distinguish the two very plainly. The septum dividing segments VIII/IX is absent; but the following septum, which is, also, frequently absent among earthworms* of this genus, is present and rather thickened. So also are septa VI/VII and VII/VIII. The large intestine commences in segment XV. The caeca are present and extend forward through 3 segments. The gizzard is rather elongate, but otherwise is not remarkable in its form.

* Compare, for example, *P. benguetensis* described in the present paper.

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^{*} Compare, for example, *P. benguetensis* described in the present paper.

The last hearts are in segment XII.

The sperm reservoirs are in segments X and XI, and those of each side of the body are perfectly distinct.

The sperm sacs are in 3 pairs and are situated in segments X, XI, and XII. The pair belonging to the XIth segment is the smallest.

There seems to be a pair of minute ovisacs in segment XIII lying above the very much larger ovaries. The spermathecae are present to the number of 5 pairs and this is the most salient internal difference of structure between the present species and *P. orientalis*. They lie in segments V—IX, the last pair opening between segments VIII/IX. The diverticulum is quite as long as the spermatheca itself. It consists of a very slender duct ending in a long and club-shaped sperm pouch, which has the usual chalk-white appearance and doubtless, as in other Oligochaeta, is the sperm-holding apparatus. It will be noted that the diverticulum is much longer than in *P. orientalis* and, also, rather differently shaped.

The spermiducal glands of this species are large, but not so extensive as in *P. orientalis*. Instead of extending through fully 4 segments as in the last-named species, these glands extend through only 3 segments in *Pheretima albobrunnea*. They are, also, much broader in proportion to their length than are the glands of *P. orientalis*. Each gland is divided into 3 principal lobes which are again somewhat subdivided. The duct is rather long and arranged in a different way from that of the last species. The duct emerges from the middle of the gland and runs toward the middle of the body, then bends backward, and runs parallel with itself to the point of opening. The latter portion of the duct is stouter than the anterior portion. There is no bursa copulatrix.

Pheretima sodalis sp. nov.

The same bottle which contained the specimens of *Pheretima orientalis* and *P. albobrunnea* contained, also, a number of examples of a third species closely resembling those two in both external and internal characters. Nevertheless, I believe it belongs to a perfectly distinct species, differing from either *P. albobrunnea* or *P. orientalis* quite as much as those differ from each other. *P. sodalis*, indeed, is even difficult to distinguish by external characters without a careful examination, for there is the same lack of coloration as in its allies and the clitellum with

its setæ is precisely like those of the 2 species with which it must be compared. A description of one will serve for that of the other. The only recognizable difference which serves to discriminate the species externally is the condition of the male pores upon segment XVIII. These pores are rather widely separated, much as in *P. albobrunnea*. There are, however, only about 8 to 10 setæ between them, since the setæ cease a little way before the actual male pore. The latter is very conspicuous on each side of the body, although it is rather the elevation upon which it is borne than the actual orifice which is of large size. In the neighborhood of these pores, there are no genital papillæ; and it is the lack of these structures which at once distinguishes the present species from its allies. As all the 6 individuals of the species were the same, this character seems to me to be fully established as distinctive.

In its internal characters, *Pheretima sodalis* is somewhat intermediate between its near allies *P. orientalis* and *P. albobrunnea*; and it possesses, also, some characters peculiar to itself. Thus the septa of certain segments appear to me to be more strengthened than in either of the two species which I have just described. This was particularly the case with septa VI/VII and VII/VIII. Moreover, in the region of the gonads more segments are thickened than in those species of *Pheretima*, for in *Pheretima sodalis* the last of these specially thickened septa separated segments XIV/XV. As in the other two species, septum IX/X was present and septum VIII/IX absent.

The alimentary tract is like that of the two allied species and the cæca are present, but blunt and short. The last hearts are in segment XII. There are 3 pairs of sperm sacs in segments X—XII. In segment XIV is apparently a pair of ovisacs of considerable relative size, and in any case larger than the ovaries of segment XIII.

The spermiducal glands are large like those of *P. orientalis*, and there is the same tendency to division into finger-shaped, narrow, parallel lobes. They occupy segments XVI—XX. The duct runs at first forward and then backward, opening about opposite to its original emergence from the gland in segment XVIII. The spermathecæ are on the other hand rather more like those of *P. albobrunnea*. There are 5 pairs lying in line. The club-shaped diverticulum is not so long as the main pouch and opens into its narrow duct near the external extremity.

Pheretima pauaiensis sp. nov.

Closely alike in external appearance to *Pheretima orientalis* is a worm which I am obliged to regard as being of a new species.

It measures 70 millimeters in length and 3 to 3.5 millimeters in diameter and is, therefore, of about the same size as *P. orientalis* and others of its allies described in the present paper. It has, also, the same color and is indeed of exactly the same outward appearance.

The clitellum is of the same nature and ceases before the row of setæ of segment XVI. The other segments, of which it is composed, also have setæ upon them. The male pores are very conspicuous and much like those of *Pheretima sodalis*. They lie naturally upon segment XVIII in the line of setæ and are separated by about 10 setæ. The external feature which makes the present species particularly recall *P. orientalis* is the form of the genital papillæ.

The genital papillæ of *Pheretima pauaiensis* consist of a pair of apparently perfectly circular, disc-like cushions suggestive in color and size of the genital papillæ of *P. orientalis*, although very different in other details as will be seen presently. The 2 papillæ are approximated in the mid-ventral line of the body, being separated by an area which is about equal to the diameter of one of them. The papillæ lie upon 2 segments reaching from just behind the circle of setæ of segment XIX to just in front of the circle of setæ of segment XX. They are not interrupted (that is, made hour-glass shape) at the intersegmental groove.

The internal anatomy is not very different from that of *P. orientalis* and of its immediate allies described in the present paper.

There are 3 stoutish septa in front of the gizzard and those from IX—XIII enclosing the sperm sacs are also more strongly developed than those which follow. Cæca are present but not very long. The last pair of hearts is in segment XII. There are 3 pairs of sperm sacs in X—XII. The spermiducal glands are rather large and extend through segments XVI—XX. They are broken into many lobes. The duct arises at about the middle of the gland and at first runs in an anterior direction; it then bends upon itself and runs backward to its orifice upon the XVIIIth segment. This section of the duct is much the wider.

The form of the spermathecæ is characteristic of *Pheretima pauaiensis* as compared with its allies hitherto described. There are 5 pairs of these organs arranged in line as in the case of

P. albobrunnea. The spermathecal pouch is not always identical in form; it is sometimes oval and sometimes conical, the apex in this case occupying the blind end. The duct portion is sharply marked off from the pouch by its narrower caliber, but this region is not markedly muscular. The diverticulum is a little longer than the pouch and of rather peculiar shape. Each diverticulum is sharply divided into the terminal chamber and a duct. The terminal chamber is oval and apparently rather flattened which gives it a racket-like form. This is enhanced by the fact that the duct is at first very narrow and broadens toward its external orifice.

Pheretima monticola sp. nov.

Two examples of this new species were collected on Mount Pulog at an altitude of 2,880 meters, "on the grassy summit." It is a stoutish worm, 130 millimeters long and 7 millimeters in diameter at the head end. The color is pale brown with some purplish-brown patches in the postclitellar region. The clitellum is dark purplish-brown. The setæ form complete circles and are typically perichætous, their arrangement not being in any way divergent from the normal. The clitellum occupies the whole of segments XIV—XVI, and is entirely without setæ.

The male pores are very conspicuous and widely separated, lying of course upon the XVIIIth segment.

The genital papillæ of this species are highly characteristic. They are only shown at their full development, I imagine, in one example of the two. In that specimen there is a pair of papillæ on segment XVII and a pair upon each of segments XIX, XX. The arrangement, in fact, is somewhat like that of *P. biserialis*, *P. forbesi*, *P. polytheca*, and *P. malayana*. But the present species has fewer of the pre- and post-genital papillæ than any of those mentioned. The papillæ are not precisely in line with the male pores. They are a trifle to the inside of them. In addition to these 3 pairs there is a fourth pair upon segment IX. I examined very carefully the adjacent segments to see if there were others, but could find none. It may be that other specimens will show a greater development of papillæ than those reported upon here. The intersegmental septa of this species differ from those of many others, for none is missing and the gizzard in consequence lies entirely in segment VIII. There is no doubt whatever about this, for it is quite easy to count the septa and to refer them to the proper boundary lines between the segments. None of the septa in front of the gizzard is especially thickened, but those which encircle the sperm sacs are rather thicker and

this is particularly to be seen in the case of segments XI and XII. In fact, septa X/XI and XI/XII are the thickest of the whole series. The septa in front of, and 1 septum behind, this series are also thick. They are connected to each other by many muscular strands of a tendinous appearance.

The alimentary tract has one feature of importance from a systematic point of view and that is the total absence of any trace of cæca. I was unable to find those outgrowths in either of the two examples studied and, therefore, presume that they are absent in the species. The intestine begins in segment XV. The gizzard lies in a single segment, the VIIIth, as already mentioned.

The organs connected with reproduction show some interesting features in the present species. The testes and sperm-duct funnels lie in segments X and XI as in all other species in which there are 2 pairs of gonads. However, they do not appear to be inclosed in testicular sacs which are so obvious in other species, but to lie freely in the segments. It might be remarked in criticism that it is hard to prove a negative and that delicate sacs enveloping the gonads may have been cut into and missed. I would rather base my statement, therefore, on positive than on negative facts. But the latter must be considered and it is pointed out that the funnels and gonads were easily exposed, apparently without cutting into any testicular sacs. Simply cutting along the line of attachment of the septa to the body wall until the region of the gonads was reached, brought the latter and their corresponding funnels into view at once.

A more positive argument is as follows, and although it only applies with certainty to the gonads and funnels of the XIth segment, it establishes the facts—that is, if it be accepted as an argument. In opening segment XI in both specimens of *Pheretima monticola*, the testes and funnels were easily seen, and arising from the anterior wall of the segment the sperm sacs belonging to it. The origin of each of these latter sacs was just above the testis belonging to it. The sac was quite as independent of the testis as is the ovisac (commonly present in this genus) of the ovary which, also, lies beneath it in a position very like that of the testis. As is abundantly shown in many figures and diagrams of the reproductive organs of *Pheretima*, the sperm sacs are outgrowths (secondary, perhaps) of the sperm reservoirs or testicular sacs. It is fair, therefore, to presume that testicular sacs, at any rate in segment XI, are wanting in *Pheretima monticola*. Sperm sacs occur in segments XI and

XII, and I think in segment X also. However, in segment X I may have mistaken masses of developing sperm for actual sacs.

The spermiducal gland is small and limited to one segment, the XVIIIth, the septa of which, however, are somewhat stretched apart to enable the gland to lie in this one segment. The gland is nearly divided into two and is compact in character; it is seen to be finely lobate when examined with a lens. The duct runs straight toward the mid-ventral line of the body; it then bends upon itself and runs parallel with its former section to its orifice, which is unprovided with a bursa copulatrix. The recurrent section of the duct is much the stouter. The ovaries and the oviducts were identified, but present nothing particularly noteworthy in appearance. The spermathecae are in 4 pairs and open on the segmental furrows V/VI and VIII/IX. It is a remarkable fact that in both (the only) specimens the VIIIth segment contained 2 pairs of spermathecae, one pair opening anteriorly, the other posteriorly; that is, between segments VIII/IX. This, indeed, furnishes one of the arguments for considering segment VIII to be separated by a septum from segment IX. In no species of *Pheretima*, so far as I am aware, does the posterior pair of spermathecae open so far back as the intersegmental groove IX/X. I believe that the inclusion of 2 successive pairs of spermathecae within the same segment is new to the genus *Pheretima*.

The spermathecae are, also, somewhat unusual in their form. The pouch has a short diverticulum, which is really a portion of the pouch itself separated by an imperfect septum, as well as the independent and characteristic diverticulum. This state of affairs, however, was not apparent in the second specimen and, therefore, need not be considered as of great importance. The duct portion of the spermatheca is not important. The diverticulum is as long as, or even slightly longer than, the pouch. It ends in an oval receptaculum seminis which was double in the case of one spermatheca. The duct is narrow and coiled.

Pheretima incerta sp. nov.

A large number of examples of a small species of *Pheretima* was collected in the immediate neighborhood of the Bureau of Science building, Manila, which present many of the external characteristics of the 3 species which I have just dealt with, but which are undoubtedly different from any of those. Nevertheless, there is the outward resemblance in the whitish-brown color of the clitellum, in the slender form and short length, and in

the fact that the clitellum does not always embrace the whole of the XVIth segment. In addition to this, there is the absence of anteriorly situated papillæ; that is, upon segments in the neighborhood of those which bear the pores of the spermatheca. The existence, however, of a pair of papillæ closely corresponding in position with the male pores upon segments XVII and XIX shows that the present species is not one of the three just described and brings it into obvious relationship with *P. posthuma*. The length of an average specimen is 70 millimeters; its diameter, 3 millimeters.

With *P. posthuma* I am well acquainted and have added several new facts in past years¹⁰ to our knowledge of its anatomy. To my certain recollection many specimens at least which I have examined differed very markedly from that with which I am concerned in the present section of my catalogue of Philippine worms in their robust build, totally different from the slender worms which I call here *Pheretima incerta*. However, both Horst and Michaelsen assert the same of that species.

Another characteristic of the species *Pheretima posthuma*, which I do not find in those specimens under examination, is the form of the prostomium. Horst¹¹ distinctly remarks upon the fact that it is prolonged backward and divides the buccal lobe. Michaelsen uses the same character in his definition of the species¹² ("Kopf tanylobisch") and presumably from his own knowledge. Horst, furthermore, particularly points out that a drawing of mine of *P. posthuma* "is inaccurate and probably has been made after a badly preserved worm." I do not recollect now what were the characters of the example which furnished that drawing. But it is clear that the slender worms which present so close a likeness to *P. posthuma* have a prostomium exactly like that which I have figured. This was the case in a good many examples and, therefore, can not be merely a question of poor preservation.

In defining¹³ the species *Pheretima posthuma* as well as in some earlier observations upon its structures, Michaelsen¹⁴ emphatically records the presence of septum VIII/IX and the ab-

¹⁰ *Ann. & Mag. Nat. Hist.* (1883), V, 12, 214; *Ibid.* (1886), V, 17, 93. *Proc. Zool. Soc. London* (1886), 298; *Ibid.* (1890), 52.

¹¹ Earthworms from the Malay Archipelago in *Zool. Ergebnisse, etc.*, Leiden (1892), 61.

¹² *Oligochaeta in Das Thierreich*, Berlin (1900), 295. *Proc. Zool. Soc. London* (1890), Pl. V, fig. 11.

¹³ *Oligochaeta in Das Thierreich*, Berlin (1900).

¹⁴ *Abhandl. Senck. naturf. Ges.*, 23, 201.

sence of septum IX/X, a condition which is precisely the reverse of that which obtains in most other species of the genus. I quite agree with him that septum VIII/IX is present; it was very obvious to me, although thin and delicate. I found, also, the septum lying between segments IX/X, which would be much less easily missed than the preceding, for it is much thicker than that which divides segments VIII/IX. It is to be remarked that in the present species, if it be a species, the 3 septa in front of the gizzard are much thicker than the slightly increased ones which follow the gizzard.

The intestinal cæca of the species *P. posthuma* appear to vary, being larger or smaller or even absent. It may be that here we really have a character which will separate true *P. posthuma* from those forms to which I have proposed here to give a new name; for in the individuals upon which I report in the present communication the cæca were small; finger-shaped, that is, not dwindling at the free extremity; and white, instead of brown like the intestine which is generally the case. The last pair of hearts is in segment XII.

The position and nature of the testicular sacs are known in *Pheretima posthuma*.¹⁵ In the examples which I refer to an allied species here, these sacs were 2 pairs and in segments X, XI, as usual. The anterior pair of sacs, however, was very markedly smaller than the posterior pair and the 2 sacs on each side of the body were in close contact. Indeed, in the specimen dissected, the sac of the Xth segment on the left side was distinctly smaller than its fellow of the right side of the body. The testicular sacs of segment XI were very large. There were clearly 2 pairs of sperm-duct funnels. The sperm sacs, as in typical *P. posthuma*, were in segments XI and XII. The sperm-duct glands of *P. posthuma* are spoken of as small ("Prostaten mit ziemlich kleinen Drüsenthail." Michaelsen). Those of the species now under consideration can not be so described, due regard being had to the slender build of the worms themselves. Each gland extended through quite 4 segments and this was the case in 2 individuals which I dissected. On the other hand, the duct seems to be, not unlike that of *P. posthuma*, but at the same time it may present differences. It is curved and S-shaped where it issues from the gland and until it makes a bend upon itself and runs directly backward toward the gland to open to the exterior without the intermediary of a bursa copulatrix.

¹⁵ See Cognetti di Martiis, *Boll. Mus. Zool. Torino* (1909), 24, No. 602.

The 4 pairs of spermathecae appear to agree with the descriptions of those of *P. posthuma*. It is important to remark that while in an adult the diverticulum was fully as long as the pouch, it was distinctly shorter in an example not fully mature. Too much stress has been at times laid upon the relative lengths of the spermatheca and its diverticulum.

Pheretima americanorum sp. nov.

A single example of this, the finest new species contained in the collection, measured when alive according to the label 12 inches, about 30 centimeters. By its preservation it has shrunk to some 20 centimeters or so. The diameter at the head end is 8 millimeters. Thus the worm is a robust species and is of about the same dimensions as *Pheretima benguetensis*, another large species contained in this collection. Its color is peculiar. There appears to have been little or no integumental pigment during life, for the color of the preserved worm is almost white, somewhat of the tint of a fresh deal board, that is, a very pale brown. This color is hardly darker upon the clitellum. The most salient external characteristic is the one afforded by the genital papillae, which are different from those of any other species hitherto described. The species which come nearest to the present in this particular are *Pheretima glandulosa* Rosa¹⁶ and *P. papulosa* Rosa,¹⁸ but there are obvious differences.

These papillae are present in the neighborhood of the male pores upon the XVIIIth segment and of those of the spermathecal pores which lie between segments VI/VII, VII/VIII, VIII/IX. The papillae themselves are minute, white warts, which contrast with the surrounding yellowish skin by their color as well as by being raised above its surface. Those belonging to the male pores are limited to the XVIIIth segment as in *Pheretima glandulosa* and do not extend to neighboring segments as they do in the other multipapillate species, *P. papulosa*. I have myself had the opportunity of studying *P. papulosa*,¹⁷ but I do not recollect the exact appearance of the papillae in that species. It is clear, however, that in *P. papulosa* they are also quite small. Those of *Pheretima americanorum* are heaped around the male pores and especially on that side which lies nearest to the mid-ventral line of the body, but they occur on both sides of the external aperture of the spermiducal glands.

¹⁶ Both are described in *Ann. Mus. Civ. Genova* (2a) 16, 525, etc.

¹⁷ *Proc. Zool. Soc. London* (1900), 644.

There must be at least 70 or 80 of them and they are partly disposed in a series of curves internal to each other upon the inner side of the orifice of the spermiducal glands; now and then these papillæ are not very easily distinguishable from the skin which they cover. Precisely similar, though less numerous, papillæ occur close to the spermathecal pores, and in this case they cover a portion of the skin both anterior and posterior to the orifice of the spermatheca. Here the papillæ are more numerous in the case of the posterior spermathecal pores and less numerous around the anterior pair of spermathecal pores. I have dealt with the genital papillæ before the other external characters since they are the most obvious of those characters and of themselves serve to distinguish this species from any other.

The setæ of this species form completely closed circles around each segment (except of course, the 1st), without any trace of either a dorsal or a ventral gap. The setæ of the anterior segments are not larger than of those which follow; nor is there any increase in size, or greater crowding together, of the ventrally situated setæ.

The clitellum occupies the whole of segments XIV—XVI and has complete circles of setæ upon each of these. The dorsal pores commence in XII/XIII and are not to be seen upon the clitellum.

The oviducal pore is upon a rhomboid area of which the middle is traversed by the line of setæ of segment XIV. The male pores are not very far apart and are separated by 6 or 7 setæ.

The spermathecal pores are 3 pairs on VI/VII—VIII/IX.

Some of the intersegmental septa are considerably thickened in this species. I recognize 4 septa in front of the gizzard, all of which are rather thick and much interconnected by slips of muscle as is very commonly the case in large earthworms. The gizzard-septa themselves are absent in those septa which should separate segments VIII/IX and IX/X. The following 4 septa are thickened and also much bound to each other by tendinous-looking threads. With reference to the vascular system, I have noticed that the dorsal vessel becomes suddenly much increased in caliber in segment XIII, reckoning from behind forward, the presumed direction of the blood current. The last pair of hearts is in segment XIII; these hearts, like the 2 preceding pairs are of large caliber, greater than those of the Xth segment.

The large intestine begins in segment XV and there is a pair of cæca extending through 3 segments.

That section of the cesophagus which immediately follows the gizzard and lies in segments X, XI, XII, and perhaps XIII, is very vascular and has thick walls; it evidently corresponds to the region which in other earthworms is furnished with those glandular outgrowths known as calciferous glands. The gizzard is well developed and shows nothing remarkable in its form.

The spermathecae are 8 pairs and lie in segments VII, VIII, IX, opening as already stated. They are long and oval, measuring 5 millimeters in length, and have a short, but perfectly distinct, muscular duct. The diverticulum has a slender duct and long, oval, swollen extremity; it is of about one-half the length of the pouch.

The ovaries are large and lie in segment XIII. Well above each is a longish narrower ovisac.

The testicular sacs of this representative of the genus are remarkable. Attached to the front of the wall separating segments X, XI, that is, lying in segment X, is a smallish, irregularly spherical sac which I identify with the anterior testicular sac from its position and general relations. From the opposite side of the septum, that is, in the VIth segment, the sperm duct could be clearly seen running from the septum on to the ventral parietes. Shortly after leaving the posterior face of septum X/XI, a slender tube was seen to leave the sperm duct, to swell out into a lateral, circular diverticulum, and then to join the testicular sac affixed to the posterior wall of segment XI. This tube, widened in the way described, is evidently the connection between the two successive testicular sacs of segments X and XI. These sacs are well known to be connected in certain species of earthworms, such as *Pheretima montana* (according to Ude),¹⁶ and not to be so connected in others; for example, *P. benguetensis*, described in the present memoir.

The mode of connection seen in *P. americanorum* is quite unusual in the genus and, I think, at present unique. It should be explained that the delicate tube which appears to leave the sperm duct and which communicates with the testicular sac of segment XI is not a diverticulum of the sperm duct. Although I have not made a microscopical examination of these parts, I presume that the tube merely envelopes the sperm duct and is an outgrowth from the testicular sac of segment X.

The sperm sacs of this species are 2 pairs and lie in segments X and XI. They are somewhat tongue-shaped, and arise from a

¹⁶ Ztschr. f. wiss. Zool. (1905), 83, 477, fig. 4.

very narrow stalk which is easily broken and may be seen to communicate with the testicular sac by a narrow orifice. Each sperm sac is prolonged distally into a very narrow appendix, which arises abruptly from the rather squared end of the main part of the sac. The arrangement, in fact, is very like that in many other species of *Pheretima*, including *P. decipiens* described in the present paper.

It is important to note that the two sperm ducts of each side join shortly behind the septum dividing segments XI and XII.

The spermiducal glands of *P. americanorum* are large and extend through segments XVI—XXII. They appear to me to be primarily divisible into 3 large lobes; but in any case, they are greatly subdivided into small lobes of unequal size. The gland, however, is solid, the lobes being close together and not separated by much interstitial tissue. The duct of the gland is moderately thick, and arises from about the middle of the gland. It runs a perfectly straight course to its external orifice, a course transverse to the long axis of the body of the worm. The duct of the spermiducal gland does not vary in width through its course. The external appearance of the genital area gave me the impression that there would prove to be a bursa copulatrix. However, there is nothing of the kind in this species. The spermiducal gland measures 11.5 millimeters in length.

ILLUSTRATIONS.

(Drawings by W. S. Berridge.)

PLATE I.

- FIG. 1. *Pheretima benguetensis* sp. nov.
2. *Pheretima orientalis* sp. nov.
3. *Pheretima albobrunnea* sp. nov.
4. *Pheretima americanorum* sp. nov.

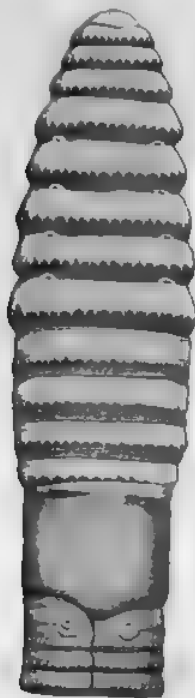


Fig. 1.

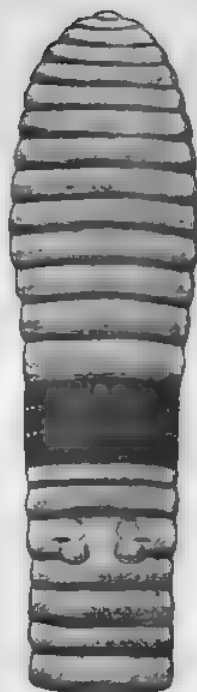


Fig. 2.

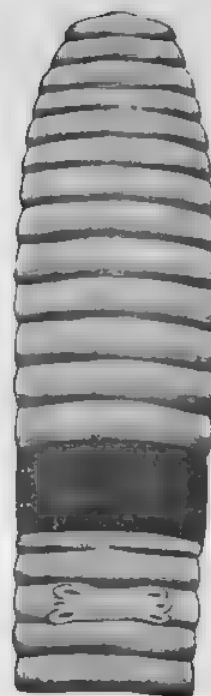


Fig. 3.



Fig. 4.

PLATE I. FOUR NEW SPECIES OF PHILIPPINE EARTHWORMS.

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REVIEWS.

A Monograph of the Anopheline Mosquitoes of India. By S. P. James, M. D., D. P. H., I. M. S., and W. Glen Liston, M. D., D. P. H., I. M. S., Second Edition. Re-written and enlarged. Calcutta: Thacker, Spink and Co., 1911. 4to. pp. 1-128. 86 plates. 17 text-figures. Price \$6.25.

The avowed purpose of this work is that of "describing the different species in such a manner that any specimen collected will be easily identified as this is the most important requirement of any book dealing with mosquitoes."

As this book is prepared ostensibly for the use of physicians and practical sanitarians, we may therefore overlook with some propriety the fact that in so far as classification is concerned the work is supposed to deal with female mosquitoes exclusively.

Had the authors stopped at "describing the different species in such manner that any specimen collected [might] be easily identified," their work would have been less liable to adverse criticism by systematists, but they, like so many medical men not trained in systematic zoölogy, have attempted to dabble in generic legerdemain, thereby increasing the confusion already present in culicid classification and adding to the burden of synonymy which must be borne, not by men of their profession, but by the already incumbered entomologist.

Chapter I deals with a general account of mosquitoes. It contains many inaccuracies, which, while known to be such by technical men, are liable to mislead, as for example (page 1): "the eggs float on the water *for some days* (two or four) after which time they hatch." Experience in the Philippines shows that *Culex fatigans* eggs hatch, *as a rule* within twenty-four hours, so that one to four or more days would have been more accurate.

The males of mosquitoes do not possess a *piercing* proboscis.

The proboscis in the Megarhininae is *not bent back* but bent toward the venter.

Every observation (of several hundreds) made on the members of the genus *Culex* in these Islands goes to show that the

eggs are laid by the female *directly* upon the water singly and adhere to each other by their sides (not edges) and that they are not collected together in a raft *before* deposition. Neither does the female allow the egg-raft to drop into the water. All Culicidae, so far observed, lay their eggs *directly* upon the surface or upon the moist portion of containers directly above the water surface, in which latter case the eggs adhere to this surface until the larvæ hatch. This may not, however, have been the experience of these authors.

No portion of the individual eggs, in an egg-raft, is submerged¹ as stated on page 5.

The palmate hairs of Anophelinae larvæ and others are more nearly like the leaf of *Livistona* spp. than that of the coconut palm. They are not limited to the larvæ of Anophelinae (p. 6), being found upon the larvæ of *Aedeomyia squammipenna* Arrib.

Few mosquitoes have a straight proboscis, it being usually slightly double curved or S-shaped (p. 11).

The prothoracic lobes of mosquitoes are not *patagia*, nor is the thorax "mainly composed" of a middle division or mesothorax, the other portions being as necessary to its structure as this (p. 11).

The terms *tergite* and *sternite* are the correct ones to use in connection with the abdominal sclerites of insects. The anus opens on the dorso-caudal surface and not the ventral surface of the last abdominal segment (p. 12).

The relative lengths of the first submarginal and the second posterior cells of the wings of Culicidae are of generic and family as well as of specific importance (p. 13).

Why change the nomenclature of the wing veins, producing such unwarranted innovations as: "The most important of these *transverse* veins is the subcostal," when Theobald and others define the subcostal as a longitudinal and not a transverse vein? (p. 13).

Cordate and obcordate are terms more uniform with ovate, obovate, oblanceolate, etc., than are cordiform and obcordiform. The idea of using these terms to designate scale forms in insects is an excellent one.

¹ Vide Banks, *This Journal*, Sec. A (1908), 3, 251, Pl. 8, fig. 2.

It is not true that all larvæ of the genus *Culex* have long, thin respiratory siphons as e. g. *C. fatigans*.

How is it possible for scale shapes to be of both *generic* and *specific* importance to entomologists?

Of course such a juggling with scientific names as that on page 18 is obviously not permissible, *maculipalpis* James & Liston and *nigerrimus* James & Liston being entirely untenable.

The directions for collecting mosquitoes, given in Chapter II, are very good, but the method of mounting on disks is antiquated, slovenly, and entirely unsatisfactory when the worker desires to examine the ventral surface of the specimen. It is slovenly because by passing a pin through the thorax it is impossible to avoid removing scales which are important in classification. That method describing the use of cork or pith is much more satisfactory in every respect and it alone should have been given.

On page 11 "upright forked scales" is criticized and the expression is then used on page 28 and repeatedly elsewhere, an obvious inconsistency.

The prothoracic lobes are spoken of on page 30 as if they were appendages rather than a part of the thorax itself.

The term *promontory* as used on page 40 and elsewhere is not entomological.

Nyssomyzomyia as a substitute for *Pseudomyzomyia*, on pages 43 and 44, is assuredly an unwarranted innovation in systematic entomology.

May we be delivered from the necessity of a subgenus as intimated in the footnote on page 46!

On page 49 we have *Myzorhynchus nigerrimus* James & Liston and *M. nigerrimus* Giles! On page 54 we are told that this species, that is, *M. nigerrimus* James & Liston is *sinensis*! Could there be anything more beautifully systematic than this?

To pick out all the anomalies and absurdities of classification would lengthen too greatly this already lengthy review.

Suffice it to say that such an attempt as Messrs. James and Liston have made should never be undertaken under the limited conditions of inaccessibility to large collections and extensive literature which must have been theirs in the preparation of their book. It had been far better to give merely descriptions, leaving systematic work to that future Alexander who might cut the Gordian knot into which the classification of the Culiidae is tied.

Several inaccuracies and inconsistencies in orthography occur

as, for example, the spelling of *ludlowii* and *rossii* with one or two terminal vowels; on the same page (105), Philippine Islands with two *l*'s, and the absence of the second "e" in *Wiedemann*, together with several others.

The larval characters and habits of *Myzomyia ludlowii* Theob., *rossii* Giles, were described in detail in 1907 and 1908² though Messrs. James & Liston have stated on page 104 that they are not known. Possibly this remark has reference to *M. indefinita* which is hardly to be considered a valid species.

Most of the illustrations are very good, especially the line plates and text figures, but the color of the "coloured" plates is, to say the least, bizarre, while figures like those on page 8 should never be allowed to appear in any text.

There is no doubt that a very honest attempt has been made in this book to give a means of assistance to hundreds of non-technical men, but clarity and exactness should hardly be sacrificed to popularity in a publication which bears the hall marks of a scientific contribution.

Aside from the unfortunate selection of a color for the plate paper, the general appearance of the book is good.

C. S. B.

Who's Who in Science (International) 1912. Edited by H. H. Stephenson. New York. The Macmillan Company. Cloth. Pp. XVI+335. Price \$2.

Aside from the preface and the contents, this book consists of six parts; namely, abbreviations, obituary for 1911, the world's universities, biographies, supplementary list, and classified index.

The first three parts will be useful, while the fourth, biographies, is the major part of the book and should be of great service to librarians, editors, and scientists. In this part the names of scientific men are arranged alphabetically with degrees, places of birth and education, address, past and present positions held, publications, and lines of present interest and research.

The supplementary list covers less than two pages and contains some names omitted from the main list.

In compiling this list the author restricts science to the natural and applied sciences, excluding the sometimes so-called sciences of economics, sociology, psychology, education, and exploration.

² *This Journal*, Sec. B (1907), 2, 513, Sec. B (1908), 3, 335.

The chief fault of this book is its incompleteness. As an example; under zoölogy, but 116 names are recorded for the United States and in several branches of work some of the most prominent men are omitted. These facts lead the reviewer to suspect that the same fault exists with regard to other sciences.

The classified index is a useful one. Here the bare names are arranged under subjects and countries.

The book is well planned and the mechanical work is excellent. The names are set in Clarendon capitals which distinguishes them clearly from the balance of the text. The printing is perfect, the paper is light and dull, and the book is neatly bound in dark crimson cloth.

R. C. McG.

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Plates from photographs, the greater part of which was taken for this publication, show ornaments, houses, men making fire with bamboo, bows and arrows, dances, and various types of the people themselves.